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HAMILTON STANDARD

DIVISION OF UNITED AIRCRAFT CORPORATION

WINDSOR LOCKS, CONNECTICUT, U. S. A.

SPECIFICATION NUMBER 1234F

TITLE ENGINE CONTROL JFC-47-1

ACCEPTANCE OF

+ HST

PREPARED BY	H. Mercik	DATE	APPROVED BY	D. A. Prue	DATE 1/12/62
APPROVED BY (PROJECT ENGR.)	D. T. Feldman	DATE	APPROVED BY		DATE
APPROVED BY (DESIGN)		DATE	EXP. RELEASE	Ernest P. Noske	DATE 11/8/61
APPROVED BY (INSPECTION DEPT.)		DATE	APPROVED BY (PRODUCTION DEPT.)		DATE
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1.0 GENERAL INFORMATION

1.1 SCOPE

This Specification covers the performance requirements for the model JFC-47 Main Engine Control independent of Main Engine Pump.

1.1.1 DESCRIPTION OF CONTENTS

The Test Requirements in this specification are divided into four basic sections as follows:

I.	Pre-hot test performance	5
II.	Hot Test	10
III.	Final Data	10
IV.	Audit	5

The tests outlined in section I are required in order to define the performance of the control after all systems have been adjusted and calibrated to ensure that the unit is functioning satisfactorily before hot testing.

The tests in section II are comparative fuel temperature tests. These tests will define high temperature performance and schedule shifts as a function of fuel temperature changes.

The tests in section III define the control performance and accuracies of the entire map of control functions.

The test in section IV is a check to determine control repeatability and integrity.

1.2 Equipment Required

1.2.1 A flow bench with Main Pumps capable of supplying PMC9073 Fuel at the rate of 40 000 pph at 1000 psi, maintaining a fuel temperature of 100 ±5°F.

1.2.2 A drive capable of driving the control at 0-4600 RPM, with 1/2% regulation; 1/4% drift. Drive must be capable of setting speed within ±2 RPM. Speed indication must be within ±1 RPM.

1.2.3 A pneumatic pressure and vacuum source capable of maintaining any pressure from 2 to 200 psia, to simulate engine burner pressure (Pb).

1.2.4 A pneumatic pressure and vacuum source capable of maintaining any pressure from 1 to 50 psia, to simulate engine inlet pressure (Pt2).

1.2.5 Thermocouples and an indicating unit with ±3°F accuracy for measuring temperatures between -65° and +300°F, and ±5°F accuracy between 300° and 900°F.

1.2.6 Flowmeters

Metered Flow	1000 - 40,000 PPH	±1/2 Accuracy
Total Flow	1500 - 40,000 PPH	±1/2 Accuracy
Transducer Flow	100 - 1,000 PPH	±1% Accuracy

1.2.7 Pressure Gages

Control Inlet	0-2000 psi ±1% Accuracy
Control Discharge	0-1000 psi ±1% Accuracy
Throttle Valve Differential	10-50 psi ±1% Accuracy
Control Body	0-300 psi ±1% Accuracy
Afterburner Signal	0-1000 psi ±1% Accuracy
Area Control Inlet	0-1500 psi ±1% Accuracy
Area Control Metered	0-1000 psi ±1% Accuracy
Compressor Inlet	0-50 psia ±.25% Accuracy
Burner	0-200 psia ±.25% Accuracy
Main Shutoff Valve Signal	0-1000 psi ±1% Accuracy
Recirculating Valve Signal	0-1000 psi ±1% Accuracy
Pump Inlet	0-100 psi ±1% Accuracy

1.2.8 A system shall be provided to maintain the control discharge pressure within 10% of curve number 1.

1.2.9 Torque measuring equipment to read torque (10-100 in-lbs.) at the CBA shaft. Readings shall be accurate to ±3 in-lbs. A protractor is required to measure rotation of CBA shaft (60° total).

1.2.10 Torque measuring equipment to read torque (0 - 30 inch-pounds) at the power lever with an accuracy of ±1 in-lb.

1.2.11 A power lever protractor which will allow reading and setting the power lever to any desired angle between -10° and 130° and reading the angle to an accuracy of 1/2°.

1.2.12 An adjustable stop shall be provided to satisfy the requirements of paragraph 11.1.

1.2.13 At the room temperature, rig temperature baths or an oven are required to set Tt2 at the following temperatures: -65°F, 0°F, +59°F, 150°F, 250°F, 300°F, 415°F, 550°F, and 750°F. Temperature control must be maintained within ±2°F up to 200°F and within ±1% above 200°F.

1.2.14 Pressure relief valves shall be incorporated to limit inlet pressure (Pf2) to 1200 psi maximum and body pressure (Pf1) to 260 psi maximum.

1.2.15 Nc, Tt2, and Pt2 servo position indicating fixtures with a range of 1.50 inches reading in increments of .001 maximum.

1.2.16 Fixed Orifices

1.2.16.1 Orifice "W" (Reference Figure 2 and Paragraph 9.4) - .0325 ± .0025" diameter.

1.2.16.2 Orifice "X" and Valve A (Reference Figure 1 and Paragraph 11.1.1) - Set for 620 ± 5 pph at 500 ± 5 psi ΔP ($P_h - P_m$) with Valve A wide open.

1.2.16.3 Orifice "Y" (Reference Figure 1 and Paragraph 11.1.1) - Set for 620 ± 5 pph at 67 ± 5 psi ΔP ($P_h - P_t$).

1.2.16.4 Orifice "Z" (Reference Figure 3 and Paragraph 11.5.1) - Set for 75 ± 10 pph at 150 ± 10 psi ΔP.

1.3 Hot Test Equipment

1.3.1 A flow bench similar to that required in Paragraph 1.2.1 but capable of operating at 450°F with P&WA 523 Fuel.

1.3.2 An oven capable of varying Tt2 temperature on the sensor bulb from -65°F to 900°F.

1.4 Electrical Equipment

1.4.1 A 208 ±10 Volt, three-phase power source at 400 ±20 cycles capable of 200 watts with a "CW" and "CCW" switch for the remote trimmers. Switch shall be spring-loaded to "Off."

1.4.2 A 0-200 wattmeter with an accuracy of 2% from 100-200-watts.

1.5 Symbols Used

1.5.1 The following symbols shall be used in this specification:

Tf	Fuel Temperature (°F)
PLA	Power Lever Angle (degrees)
Pt2	Compressor Inlet Pressure (psia)
Tt2	Compressor Inlet Temperature (°F)
Pb	Main Burner Pressure (psia)
Wf	Metered Fuel Flow (pph)
Wf/Pb	Ratio of fuel in pph to Pb in psia
ΔP	Throttle Valve Differential Pressure (psi) (Pf2-Pf3)
Nc	Control Speed (RPM)
Pf2	Control Inlet Pressure (psi)

1.5.1 (Continued)

Pfl	Control Body Pressure (psi)
Ph	Area Control Inlet Pressure (psi)
Po	Area Control Drain Pressure (psi)
Pm	Area Control Metered Pressure (psi)
Wfm	Transducer Valve Fuel Flow (pph)
Pt	Transducer Valve Inlet Pressure (psi)
CW	Clockwise
CCW	Counterclockwise

2.0 Miscellaneous Instructions

2.1 Assemble the control to the drive adapter using two crush washer seals P/N 69397 -26 and -48. Caution should be used to provide correct alignment between control and adapter.

2.2 A calibration of the control shall be completed before running data required by this specification.

2.3 Pfl shall be held within the limits of Curve Number 3 unless otherwise specified. At no time shall Pfl exceed 260 psi.

2.4 Total fuel flow shall be set in accordance with Curve Number 2 unless otherwise specified.

2.5 Whenever CW and CCW adjustments are tabulated in the specification, it is assumed that the adjusting screw is viewed from the head end (drive end) of the screw.

2.6 All log sheets shall contain the rig fuel temperature and specific gravity at the temperature required during calibration.

2.7 The power lever protractor is to be installed on the control and indexed as follows:

Rotate the power lever clockwise until it hits the stop.
While applying 10 inch pounds torque to hold the power lever against the stop, set the protractor to read 0°.

Rotate the power lever counterclockwise to second rigging pin hole.

Install rigging pin (.0920 - .0945 dia.) and protractor must read $67^{\circ} \pm \frac{1^{\circ}}{2}$.

2.8 All tests are to be conducted with the control connected as defined in Figures 1, 2, and 3.

2.9 Set all inputs in the increasing direction unless otherwise specified.

2.10 Refer to applicable HS Installation Drawings for control wiring and plumbing.

2.11 Set the P_b gages to a barometrically compensated manometer before calibrating any section of this specification, depending on P_b.

2.12 Plot data of paragraphs listed in Appendix M on appropriate curves.

2.13 Maintain a fuel temperature of 100 ±5°F unless otherwise specified.

3.0 Insepction Requirement

The items marked with a single asterisk (*) in this specification are HSD inspection items and as such must be under 100% inspection by HSD. Only single-asterisked data (*) shall be transmitted to P&WA. Items marked with a double asterisk (**) shall be inspection witnessed.

**4.0 Pre-Hot Test Performance Definition (Section I)

4.1 In order to define the performance of the control after all systems have been calibrated and prior to delivery to the high temperature test rig, the following tests are to be run and data recorded on the rig on which calibration was completed. No adjustments or modifications shall be made after the start of pre-hot-test data recording until the control has completed the high temperature test phase (Paragraph 5.0).

4.2 Proof Pressure CAUTION: DO NOT EXCEED SPECIFIED PRESSURES

*4.2.1 With PLA at 65°, increase total fuel flow to 20,000 to 30,000 pph and Wf to 10,000 to 15,000 pph. Increase control Pf1 to 250 ±10 psi and Pf2 to 1,200 ±20 psi by restricting bypass return flow and control discharge flow respectively.

Maintain proof pressures until it is determined that no external leakage exists and leakage from overboard drain does not exceed 50 drops/minute.

*4.2.2 Record external and overboard drain leakage.

*4.2.2.1 Saturate the Tt2 servo to the low temperature stop and set conditions of Appendix B-1. Wf must be within limits of Appendix B-1.

*4.2.2.2 Saturate Tt2 servo to high temperature stop and set conditions of Appendix B-2. Wf must be within limits of Appendix B-2.

**4.3 Minimum Ratio Line

Set: PLA = 15°
Tt2 = 59°
Nc = 3300 ±50 rpm
Pt2 = 14.7 psia
Pf1 = 100 ± 10 psi

Supply Pf1 to the min. flow standpipe.

Actuate the remote trimmer to the full CW position.

4.3 (Continued)

Pb	Setting Direction	Pf3	W_f Limits
10	inc	220±10	1150-1250
40	inc	220±10	1960-2200
60	inc	260±20	2940-3300
100	inc	350±30	4900-5500
150	inc	450±30	7350-8250
60	dec	260±20	2940-3300
40	dec	220±10	1960-2200
10	dec	220±10	1150-1250

**4.4 Maximum Ratio Line

Set: PLA = 75°
Tt2 = 59°
Nc = 3553 ±2 rpm
Pf1 = 110 ±10 psi
Pt2 = 14.7 psia

Supply Pf1 to the minimum flow standpipe. Vary Pb and Pf3 as tabulated below and record Wf and Δ P. Approach each point from indicated direction.

Pb	Setting Direction	Pf3	Item	Limits
15	inc	220±10	1	+5 W_f/P_b of Item 5
20	inc	230±10	2	±4 W_f/P_b of Item 5
30	inc	280±20	3	±3 W_f/P_b of Item 5
70	inc	430±30	4	±2 W_f/P_b of Item 5
100	inc	550±30	5	Record W_f/P_b
150	inc	725±30	6	+2 W_f/P_b of Item 5
125	dec	550±30	7	±2 W_f/P_b of Item 5
70	dec	430±30	8	±2 W_f/P_b of Item 5
20	dec	230±10	9	±4 W_f/P_b of Item 5

**4.5 Compressor Bleed Actuator, Integrating System and Military Droop Bias

Set the conditions of Appendix A of this specification in order, reading from left to right. CBA operation, integrating speed and Wf must be within limits specified.

4.5.1 CBA Instructions

Maintain 40 in. lbs. of torque in the direction to restrain initiation of CBA shaft motion when recording all CBA points. No control of torque is necessary after motion occurs.

4.5.1 (Continued)

Increase Nc slowly from 2500 rpm until the CBA output shaft rotates fully CCW (bleeds closed). Increase Nc 175 rpm min., then decrease Nc slowly until shaft rotates fully clockwise.

4.5.2 Integration Instructions

Close Valve B and open Valve A shown in Figure 1.
Determine the Nc at which integration occurs by increasing Nc slowly and observing transducer metered pressure (Pm). Pm will decrease with increasing speed, but when the integrating piston starts to move, Pm will continue to decrease with no further increase in speed. To determine hysteresis, allow PM to saturate to its lowest level, then decrase Nc slowly until Pm starts to increase; record Nc as hysteresis.

4.5.3 Mil Wf vs Tt2 Instructions

Wf indicated is value obtained at specified Nc set.

**4.6 Remote Trimmer Operation

Set: PLA = 75°
Tt2 = 59°F
Nc = 3850 ±5 rpm
Pb = 110 psia
Pt2 = 14.7 psia
Pf1 = 125 ±10 psi
Pf3 = 610 ±30 psi

Actuate the remote trimmer to the CW stop.

**4.6.1 Record Wf. Wf must be 21230 to 21890 pph.

**4.6.2 Actuate the remote trimmer to the CCW stop. Record the number of turns which the remote trimmer makes to reach the stop and record Wf at the stop. Wf must be 1980 to 2420 less than the value recorded in 4.6.1.

**4.6.3 Actuate the remote trimmer CW to the stop and record Wf. Wf must be within limits of 4.6.1.

*5.0 HIGH TEMPERATURE OPERATION CHECK

5.1 Install the control on a test rig capable of operation with fuel temperatures of 440 ±10°F.

5.1.1 Set: PLA = 70°±5°
Tt2 = 59±5°F
Nc = 3500±50 rpm
Total Flow = 35,000 ± 3,000 pph
Pf1 = 100±10 psi

Cycle Pb from 30 to 100 Pb three (3) times.

"Plan of Test" JFC-47-1-27 (high temperature fuel test of JFC-47 Production Controls) may be used as a guide only, to fulfill the requirements of this specification.

Set total flows per Curve Number 2.

*5.2 Minimum Ratio Line

Set: Tf = 100±10°F
PLA = 15°
Tt2 = 59°F
Nc = 3300±50 rpm
Pt2 = 14.7 psia
Pf1 = 100±10 psi

Supply Pf1 to the min. flow standpipe. Actuate the remote trimmer to the full CW position.

Vary Pb and Pf3 as tabulated below and record Wf. Approach each point from indicated direction.

Pb	Setting Direction	P_{f_3}	Wf Limits
10	inc	220±10	1150-1250
40	inc	220±10	1960-2200
60	inc	260±20	2940-3300
100	inc	350±30	4900-5500
150	inc	450±30	7350-8250
60	dec	260±20	2940-3300
40	dec	220±10	1960-2200
10	dec	220±10	1150-1250

*5.3 Maximum Ratio Line

Set: Tf = 100±10°F
PLA = 75°F±5°
Tt2 = 59°
Nc = 3553 ±2 rpm
Pt2 = 14.7 psia
Pf1 = 110 ±10 psi

5.3 (Continued)

Supply Pf1 to the minimum flow standpipe. Vary Pb and Pf3 as tabulated below and record Wf and ΔP. Approach each point from indicated direction.

Pb	Setting Direction	Pf3	Item	Limits
15	inc.	220±10	1	±5 Wf/Pb of Item 5
20	inc	230±10	2	±4 Wf/Pb of Item 5
30	inc	280±20	3	±3 Wf/Pb of Item 5
70	inc	430±30	4	±2 Wf/Pb of Item 5
100	inc	550±30	5	Record Wf/Pb
150	inc	725±30	6	+2 Wf/Pb of Item 5
125	dec	550±30	7	±2 Wf/Pb of Item 5
70	dec	430±30	8	±2 Wf/Pb of Item 5
20	dec	230±10	9	±4 Wf/Pb of Item 5

*5.4 Compressor Bleed Actuator, Integrating System, Military Droop Bias

Set: Tf = 100 ±10°F. Set the conditions of Appendix A of this specification in order, reading from left to right. CBA operation, integrating speed and Wf must be within limits specified.

*5.4.1 CBA Instructions

Maintain 40 in. lbs. of torque in the direction to restrain initiation of CBA shaft motion when recording all CBA points. No control of torque is necessary after motion occurs.

Increase Nc slowly from 2500 rpm until the CBA output shaft rotates fully CCW (bleeds closed). Increase Nc 175 rpm maximum, then decrease speed slowly until shaft rotates fully clockwise.

*5.4.2 Integrating Instructions

Close Valve B and open Valve A shown in Figure 1.
Determine the Nc at which integration occurs and hysteresis as explained in Paragraph 4.5.2.

*5.4.3 Mil Wf vs Tt2 Instructions

Wf indicated is value obtained at specified Nc set.

5.5 Remote Trimmer Operation

Set: Tf = 440 ±10°F
PLA = 75°
Tt2 = 750°F
Nc = 4100 ± 50 rpm
Pb = 150 psia
Pt2 = 35 ±5 psia
Pf1 = 140 ± 20 psi
Pf3 = 400 ±50 psi

Operate control at above conditions for 4 hours.

5.5.1 Set: Tf = 440 ± 10°F
PLA = 75°
Tt2 = 59°F
Nc = 3500 ±50
Pb = 110 psia
Pt2 = 14.7 psia
Pf1 = 125 ± 10 psi
Pf3 = 610 ± 30 psi

*5.5.2 Increase Nc to 3850 ± 5 rpm and record Wf.

*5.5.3 Actuate the remote trimmer to the CCW stop, running the trimmer for 30 seconds "on" and 60 seconds "off" until the stop is reached. This precaution to prevent overheating shall be used whenever the remote trimmer is actuated at elevated temperatures. Record the number of turns which the remote trimmer makes to reach the stop and record Wf at the stop. Wf must be 1980 to 2420 less than the value redorded in Paragraph 5.5.2.

*5.5.4 Actuate the military trimmer full CW and record Wf. Wf must be within 100 pph of the Wf recorded in Paragraph 5.5.2.

*5.6 High Temperature Comparisons

*5.6.1 Repeat paragraphs 5.2 through 5.4 with Tf = 440±10°F except that Mil Wf must be within the tolerance shown in Appendix A for 440°F operation.

*5.6.2. Repeat paragraphs 5.2 through 5.5.3 with T fuel = 100 ± 10°F, excluding 5.5.

*5.6.3 The results of Paragraphs 5.2 through 5.6.2 must agree as follows: Integrating speeds at 100°F, 440°F and 100°F fuel temperatures must be within specified limits or within ±1% of each other.

Remote trimmer check at 440°F must be within specified limits.

Compressor bleed actuator checks at 100°F, 440°F and 100°F fuel temperatures must be within specified limits.

5.6.3 (Continued)

Mil Wf vs Tt2 at the two 100°F fuel checks shall be within a band width of ±3 Wf/Pb. Mil Wf vs Tt2 at 440°F shall be within ±4 Wf/Pb units and must include the two 100°F fuel checks.

If the data is within the limits specified in Appendix A, this shall be acceptable.

*6.0 FINAL DATA (Section III)

*6.1 The control shall be installed on a production bench, control adjustments "touched up" as required and final data run. No adjustments are to be made beyond this paragraph.

6.1.1 Set: PLA = 70°±5°
Tt2 = 59±5°F
Nc = 3500 ±50 rpm
Total flow = 35,000 ±3,000 pph
Pf1 = 100 ±10 psi

Cycle Pb from 30 to 100 Pb three (3) times.

7.0 SUBSYSTEM TESTS

7.1 Temperature Servo Calibration

7.1.1 Remove AN Plug from end of temperature servo housing for installation of the temperature position indicator (544900 ET-25 Ref.)

7.1.2 Index Tt2 Servo Indicator as follows:

a. Push Tt2 Piston to end of stroke and measure dimension "B" from indicator mounting surface to Tt2 piston.

b. From the assembly check list, obtain dimension "A" from indicator mounting surface to the Tt2 piston, when the follower is in the Pt2 3-D cam detent (850°F).

c. Install indicator with Tt2 piston at end of its stroke (a) above and set indicator to read .448 - (B-A).

7.1.3 Set: PLA = 75°±5°
Pb = 100 psia
Nc = 3000±100 rpm
Pf3 = 350±20 psi
Pf1 = 85±10 psi
Total flow = 30,000 ± 500 pph

7.1.4 With the conditions set in Paragraph 7.1.3, set the Tt2 in the direction indicated and record Tt2 servo dial indicator position.

Tt2	Item	Limits
-65	1	1.120 ± .005
0	2	1.026 ± .005
59	3	.935 ± .005
300	4	.740 ± .005
550	5	.600 ± .005
300	6	±.010 of Item 4
59	7	±.010 of Item 3
0	8	±.010 of Item 2
-65	9	±.010 of Item 1

7.2 Nc Servo Calibration

7.2.1 Remove Cover (P/N 578898 Ref.)) and saturation stop screw from top of linkage housing for installation of speed servo position indicator (544900-ET-9 Ref.).

7.2.2 Indexing of the speed servo indicator is accomplished as follows:

a. Obtain Distance "A" from end of cam push-rod to the cover surface at top of speed servo, when cam is in 1450 rpm L.P. This figure is given on assembly check list.

b. Bottom servo in bore by pushing on cam push-rod. Measure from cover surface at top of speed servo to cam push-rod, dimension "B".

c. Reinstall saturation screw removed in Paragraph 7.2.1. Set top of screw to a depth of "A" minus screw length, minus 0.142 inches. This will set saturation stop at approximately 200 rpm.

d. Install indicator to read servo L.P. and with servo in above position. Set indicator to read (1.357 + A - B).

7.2.3 Set: PLA = $75^{\circ}\pm5^{\circ}$
Tt2 = $59\pm5^{\circ}$F
Pf3 = 350±20 psi
Pb = 100 psia
Total flow = 30,000 ± 500 pph

7.2.4 With the conditions set in Paragraph 7.2.3, set Nc and Pf1 in the direction indicated and record speed servo dial indicator position.

7.2.4 (Continued)

Nc	Pf1	Item	Limits
1,000	40±5	1	1.432 ± .003
1,500	45±5	2	1.348 ± .003
2,100	55±5	3	1.201 ± .003
2,500	70±10	4	1.085 ± .005
3,000	85±10	5	.890 ± .005
3,400	100±20	6	.717 ± .005
3,800	125±20	7	.521 ± .005
4,200	140±25	8	.307 ± .006
3,800	125±20	9	±.005 of Item 7
3,400	100±20	10	±.005 of Item 6
3,000	85±10	11	±.005 of Item 5
2,500	70±10	12	±.005 of Item 4
2,100	55±5	13	±.005 of Item 3
1,500	45±5	14	±.005 of Item 2
1,000	40±5	15	±.005 of Item 1

7.3 Pt2 Servo Calibration

7.3.1 Index dial indicator on Pt2 servo as follows:

a. Remove cover from Pt2 servo bore.

b. Push cam in until it hits stop. Measure distance "B" from Pt2 cover surface to top of the P52 cam shoe. Average 3 readings.

c. Assemble dial indicator fixture on Pt2 cover surface; and, with cam in the above position, set dial indicator to read:

Indicator reading = A-B

Where "A" = dimension from assembly, check list, from Pt2 cover surface to top of cam, when in zero L.P. position.

7.3.2 Set:

PLA = 75 ± 5°
Tt2 = 59±5°F
Nc = 3,000 ± 10 rpm
Pb = 100 psia
Pf3 = 350±20 psi
Pf1 = 85±10 psi
Total flow = 30,000 ± 500 pph

7.3.3 With the conditions set in Paragraph 7.3.2, set Pt2 in the direction indicated and record Pt2 servo dial indicator position.

Pt2	Item	Limits
5	1	.340 ± .006
15	2	.825 ± .006
30	3	1.190 ± .006
40	4	1.365 ± .006
30	5	±.015 of Item 3
15	6	±.015 of Item 2
5	7	±.015 of Item 1

7.4 Remove dial indicators from Nc, Tt2, and Pt2 servos and install proper covers.

*8.0 PRESSURE CHECKS

*8.1 Body Pressure, Bypass Flow and Discharge Pressure Sensitivity

Set the conditions shown in Appendix C. Record Wf and ΔP for each point and record Wf/Pb where indicated. Wf and Wf/Pb must fall within the limits of Appendix C.

*8.2 Control Pressure Drop

Set: PLA = 75°
Tt2 = 59°F
Nc = 3850 ±2 rpm
Pb = 184 psia

Record Pf3 and Pf2.
Pf2 - Pf3 must be 85 psi max.

*9.0 MECHANICAL CHECKS

*9.1 Military and Idle Trimmer Range (Manual)

9.1.1 Set: PLA = 75°
Tt2 = 59°F
Nc = 3850 ±2 rpm
Pb = 100 psia

Pf_2 = 14.7 psia
Pf1 = 125 ± 10 psi
Pf3 = 610 ± 30 psi

Adjust the military trimmer full CCW.

Record Wf. Wf must be 16,600 pph max.

*9.1.2 Adjust military trimmer full CW and record Wf. Wf must be 20,500 pph min.

*9.1.3 Set the conditions of Paragraph 9.1.1 and adjust the military trimmer to obtain Wf = 19,500 - 19,700 pph.

*9.1.4 Set: PLA = 15°
Tt2 = 59°F
Nc = 1980 ±2 rpm
Pb = 100 psia

Pf2 = 14.7 psia
Pf1 = 55 ± 5 psi
Pf3 = 200 ± 20 psi

Adjust the idle trimmer full CCW.
Record Wf. Wf must be 3,150 pph max.

*9.1.5 Set: PLA = 15°
Tt2 = 59°F
Nc = 2280 ±2 rpm
Pb = 25 psia

Pf2 = 14.7 psia
Pf1 = 55 ± 5 psi
Pf3 = 200 ± 20 psi

Adjust the idle trimmer full CW.

Record Wf. Wf must be 3195 pph min.

*9.1.6 Set the conditions of Paragraph 9.1.4 and adjust the idle trimmer to obtain Wf = 3200 - 3300 pph.

*9.1.7 Set the conditions of Paragraph 9.1.1 and adjust the Military trimmer to obtain Wf = 19,500 - 19,700 pph.

*9.1.8 Repeat Paragraphs 9.1.6 and 9.1.7 until no further trimmer adjustment is necessary.

*9.2 Remote Trim Range Check

*9.2.1 Set the following conditions:

PLA = 75° ±5°
Tt2 = 59°F
Nc = 3850 ±2 rpm
Pb = 110 psi
Pt2 = 59°F
Pf1 = 125 ± 10 psi

*9.2.2 Actuate the electrical trimmer full CW using the 400 cycle supply. Record Wf and watt meter reading. Wf must be 21,230 - 21,890 pph.

*9.2.3 Actuate the electrical trimmer full CCW using the 400-cycle supply. Wf must be 1980 to 2420 pph lower than value recorded in Paragraph 9.2.2. Record Wf and wattmeter reading.

*9.2.4 Actuate the electrical trimmer full CW using the 400-cycle supply. Wf must be within limits specified in Paragraph 9.2.2.

*9.2.5 The watts required by the remote trimmer while increasing Wf and while decreasing Wf shall not exceed 190 watts.

*9.3.0 POWER LEVER CHECKS

*9.3.1 Idle Flat Check

*9.3.1.1 Set: PLA = 13°
Tt2 = 59°
Nc = 1980 ± 2 rpm
Pb = 25 psia
Pf1 = 55 ± 5 psi
Record Wf
Pt2 = 14.7 psia
Pf3 = 200 ± 20 psi

*9.3.1.2 Set: PLA = 15°
Wf must not change by more than 55 pph from the Wf recorded in 9.3.1.1.

*9.3.2 40° and 50° PLA Checks

9.3.2.1 Set: PLA = 50°
Tt2 = 59°
Nc = 3850 ±2 rpm
Pb = 100 psia
Pt2 = 14.7 psia
Pf1 = 125 ± 10 psi
Pf3 = 470 ± 10 psi

Record Wf. Wf must be 14,750 - 15,650 pph.

*9.3.2.2 Set PLA = 40° and record Wf. Wf must be 10,625 - 11,525 pph.

*9.3.3 PL Flat Check

*9.3.3.1 Set: PLA = 62°
Tt2 = 59°
Nc = 3850 ±2 rpm
Pb = 100 psia
Pt2 = 14.7 psia
Pf1 = 125 ± 10 psi
Pf3 = 560 ± 10 psi

Record Wf. Wf must be 19,300 - 19,900 pph.

*9.3.3.2 Rotate PLA to 113° and record Wf. Wf must not vary more than 100 pph during the PLA excursion from 62° to 113°. Record max. variation.

*9.3.4 120° Ramp

*9.3.4.1 Set PLA = 120° and record Wf. Wf must be 300 - 500 pph greater than the Wf recorded in 9.3.3.2 at 113° PLA.

*9.3.5 PL Hysteresis

*9.3.5.1 Set: PLA = 113° and record Wf. Wf must be within ±100 pph of the Wf recorded in 9.3.3.2.

*9.3.5.2 Set: PLA = 62° and record Wf. Wf must be within ±100 pph of the Wf recorded in 9.3.3.1.

*9.3.6 PLA Fall-Off Check (60°)

*9.3.6.1 Set: PLA = 60° and record Wf. Wf must be within 100 pph of the Wf recorded in 9.3.5.2. (62°PLA)

*9.3.6.2 Set: PLA = 58° and record Wf. Wf must decrease 150 pph min. from the Wf recorded in 9.3.6.1 (60° PLA).

*9.4.0 SEQUENCING VALVE TEST

9.4.1 Install orifice "W" per Figure 2. Orifice requirements per Paragraph 1.2.15.

9.4.1.1 Set: PLA = 12°
Tt2 = 59°F
Nc = 2000 ± 50 rpm
Pf1 = 50 psi
Pf2 = 300 psi (Set with Pb)

*9.4.2 Recirculating signal pressure shall be 260 psi minimum. S.O.V. signal shall be 125 psi maximum. Record both signal pressures.

*9.4.3 Note the PLA at which Recirculating Valve Signal is 150 psi. This must occur at 8° to 11° PLA. S.O.V. signal shall be 125 psi maximum. Record both signal pressures.

*9.4.4 Set PLA to 7°. Recirculating signal and shut-off valve signal must both be less than 125 psi. Record both signal pressures.

*9.4.5 Note the PLA at which the shut-off valve signal is 150 psi. This must occur at 3° to 6° PLA. Recirculting signal shall be at 125 psi max. Record both signal pressures.

*9.4.6 Set PLA to 2°. Shut-off valve signal shall be 260 psi minimum. Recirculating valve signal shall be 125 psi max. Record both signal pressures.

*9.5.0 POWER LEVER TORQUE TEST

*9.5.1 Set: PLA = 120°
Tt2 = 59°
Nc = 3300 ± 50 rpm
Pb = 30 psia
Pf1 = 100 ± 5 psig

Measure torque required to move to 0° PLA and then back to 120° PLA.

*9.5.2 Power lever torque limits:

From 120° to 65° PLA 5 in-lbs. max.
From 65° to 120° PLA 25 in-lbs. max.

From 0° to 65° PLA 25 in-lbs. max.
From 65° to 120° PLA 5 in-lbs. max.

10.0 FUEL FLOW CHECKS

*10.1 Min. - Max. Line and Min. Flow Check

*10.1.1 To run a min. ratio line and check min. flow, set:

PLA = 15°
Tt2 = 59°F
Nc = 3300 ± 50 rpm
Pf1 = 100 ± 5 psi

Supply Pf1 to min. flow standpipe to obtain starting min. flow.

Vary Pb and Pf3 as indicated below and record Wf and Δ P. Approach each point from indicated direction.

Pb	Setting Direction	Pf3	Wf Limits
10	inc	220±10	1150-1250 pph
20	inc	220±10	1150-1250 pph
40	inc	220±10	1960-2200 pph
60	inc	260±20	2940-3300 pph
100	inc	350±30	4900-5500 pph
150	inc	450±30	7350-8250 pph
60	dec	260±20	2940-3300 pph
40	dec	220±10	1960-2200 pph
10	dec	222±10	1150-1250 pph

*10.1.1.1 Maintain the set conditions of 10.1.1 except increase Pb to 50±5 psia. Set pressure to minimum flow standpipe to 2800 ±100 psi to obtain flight min. flow and then reduce Pb to 10 psia and record Wf. Wf must be 1700 to 1800 pph.

*10.1.2 To run a max. line, set:

PLA = 75°
Tt2 = 59°F
Nc = 3553 ±2 rpm
Pf1 = 110 ±5 psi

Supply Pf1 to min. flow standpipe. Vary Pb and Pf3 as tabulated below and record Wf and Δ P. Approach each point from indicated direction.

10.1.2

Pb	Setting Direction	Pf3	Item	Limits
15	inc	220±10	1	±5 Wf/Pb of Item 7
20	inc	230±10	2	±4 Wf/Pb of Item 7
30	inc	280±20	3	±3 Wf/Pb of Item 7
40	inc	310±30	4	±3 Wf/Pb of Item 7
50	inc	360±30	5	±2 Wf/Pb of Item 7
70	inc	430±30	6	±2 Wf/Pb of Item 7
100	inc	550±30	7	Record Wf/Pb
125	inc	625±30	8	±2 Wf/Pb of Item 7
150	inc	725±30	9	±2 Wf/Pb of Item 7
125	dec	625±30	10	±2 Wf/Pb of Item 7
70	dec	430±30	11	±2 Wf/Pb of Item 7
40	dec	310±30	12	±3 Wf/Pb of Item 7
20	dec	230±10	13	±4 Wf/Pb of Item 7

*10.2.0 Starting Schedule

*10.2.1 Set the conditions shown in Appendix D. Wf must fall within the limits of Appendix D. Record Wf.

*10.3.0 Acceleration Limiting and Topping Schedule

*10.3.1 Set the conditions shown in Appendix E. Wf must fall within the limits of Appendix E. Record Wf.

*10.4.0 Acceleration Bias, Mil. Wf, Mil Nc, and Topping vs T_{t2}

*10.4.1 Acceleration Bias

*10.4.1.1 Set the conditions in Appendix F at points coded B and record Wf. Wf must be within the limits specified.

*10.4.2 Mil. Wf

*10.4.2.1 Set the conditions in Appendix F at points coded F and record Wf. Wf must be within the limits specified.

*10.4.3 Mil Nc

*10.4.3.1 Set the conditions in Appendix F at points coded S. Determine Nc at which integration occurs as defined in Paragraph 4.5.2 and record. Nc must be within the limits specified. Record Wf at Nc recorded at the start of integration. Record Pm at the start and end of integration.

*10.4.4 Topping

*10.4.4.1 Set the conditions in Appendix F at points coded T. Set Wf with Nc and record Nc. Nc must be within the limits specified.

*10.5.0 MILITARY AND IDLE DROOP LINES

*10.5.1 Set the conditions shown in Appendix G. Wf shall be within the limits specified in Appendix G. Record Wf.

*10.6.0 IDLE DROOP BIAS

*10.6.1 Set the conditions shown in Appendix H. Wf shall be within the limits specified in Appendix H. Record Wf.

*10.7.0 CDP LIMITER

*10.7.1 Set the following conditions:

PLA = 75°
Tt2 = 59°F
Nc = 3850 +2 rpm
Pf1 = 120 ±5 psi

*10.7.2 Set Pb to the values listed in Appendix J. Wf shall be within limits of Appendix J.

Record Wf and Δ P.

*11.0 PROPORTIONAL, CBA AND INTEGRATING SYSTEMS

*11.1 Exhaust Nozzle Area Proportional System

*11.1.1 Remove CBA housing. Install a suitable block on top of the integrating piston to block the piston .342 in from stop surface on CBA side of bore. Install a dummy CBA cover and bleed the top side of the integrating piston so that the piston will be forced against the block. Install fixed orifices "X" and "Y" as shown in Figure 1. Orifice requirements per Paragraph 1.2.15.

*11.1.2 Set: PLA = 75°
Tt2 = 59°F
Nc = 3850 ±2 rpm
Pb = 100 psia
Pt2 = 14.7 psia
Pf1 = 120 ±10 psi
Pf3 = 300 ±50 psi
Ph = 1050 ±10 psi
Po = 50 ±10 psi

Close Valve A and open Valve B (Figure 1).
NOTE: Set Pt2 and Nc in increasing direction.

*11.1.3 Vary Nc in accordance with Appendix K-1. Set Pm = 550 psi using Valve B for each check point and record Wfm. Values must fall within the limits of Appendix K-1.

*11.1.4 Set the conditions of Paragraph 11.1.2, except set: Pt2 = 9.3 psia.

*11.1.5 Vary Nc in accordance with Appendix K-2. Wfm must fall within the limits specified. Record Wfm.

*11.1.6 Set the conditions of Paragraph 11.1.2, except set: Pt2 = 40 psia.

*11.1.7 Vary Nc in accordance with Appendix K-3. Wfm must fall within the limits specified. Record Wfm.

*11.2 Proportional System Deadband

*11.2.1 Set the conditions of Paragraph 11.1.2 with Valve B closed and Valve A open. Set Nc = 3745 ±2 rpm.

Approach the above speed in the increasing rpm direction. Note Pm.

*11.2.2 Decrease Nc until Pm starts to increase above that recorded for increasing Nc. Speed at this point must be within 40 rpm of speed set in Paragraph 11.2.1. Record Nc at which Pm starts to increase.

*11.2.3 Increase Nc to 3940 ±2 rpm. Note Pm.

11.2.4 Decrease Nc until Pm starts to increase above that recorded for increasing Nc. Speed at this point must be within 40 rpm of speed set in Paragraph 11.2.3. Record Nc at which Pm starts to increase.

*11.3.0 Compressor Bleed Actuator

*11.3.1 Maintain 40 in.-lbs. of torque in the direction to restrain CBA motion when recording all CBA points.

*11.3.2 Set the conditions shown in Appendix L. Increase the control speed slowly from 2500 rpm until the CBA output shaft rotates full CCW (bleeds close). This speed must fall within limits specified for "Bleeds Close." Record actual speed.

*11.3.3 Continue to increase speed until CBA output shaft rotates full CW (bleeds open) or until 4600 rpm is reached. Speed at which bleed shaft rotates must fall within limits specified for "bleeds open," in Appendix L. Record actual rpm.

*11.3.4 Decrease speed to check hysteresis in speeds at which CBA output shaft rotates. Record actual speed values. Hysteresis must be within limits shown in Appendix L.

*11.4.0 CBA Pilot Valve Actuator Stall Torque and Angular Motion

*11.4.1 Set: PLA = 15°
Pb = 15 psia
Nc = 3750 ±10 rpm
Tt2 = 59°F
Pf3 = 230 psi
Pf1 = 120 ±5 psi

*11.4.2 Apply 40 in-lbs. CCW to the CBA shaft and set the CBA protractor to zero (0°).

*11.4.3 Apply 40 in-lbs. CW to the CBA shaft and record the angle.

*11.4.4 Decrease Nc and record the Nc that the CBA shaft rotated CW.

*11.4.5 Apply 40 in-lbs. CCW to the CBA shaft. Record the CBA shaft angle and subtract the angle recorded in Paragraph 11.4.3. The difference must be greater than 30°.

*11.4.6 Apply 40 in-lbs. CW to the CBA shaft and record the CBA shaft angle. The angle recorded must be less than 35°.

*11.4.7 Decrease speed 20 ±2 rpm less than value noted in 11.4.4. Apply CCW torque to CBA shaft. Shaft must not rotate CCW with 75 in-lbs. of torque applied. Record torque to rotate shaft if shaft rotates at less than 75 in-lbs.

*11.5.0 Integrating System & A/B Signal

*11.5.1 Install orifice "Z" per Figure 3.

*11.5.1.1 Set: PLA = 75°
Tt2 = 59°F
Pb = 60 psia
Pt2 = 14.7 psia
Pf1 = 110 ±10 psi
Pf3 = 300 psi
Ph = 1050 psi
Po = 50 ±10 psi

*11.5.1.2 Increase Nc until A/B signal pressure equals 200 ±5 psi and record Nc. Nc must equal 3395 to 3535 rpm.

*11.5.2 Open Valve A and close Valve B (Refer to Figure 1).

*11.5.2.1 With the conditions set as in Paragraph 11.5.11, determine the speed at which the system integrates at increasing speed and at decreasing speed. Record speed at each point and hysteresis. Hysteresis shall be less than 20 rpm. The speed at which integration occurs is explained in Paragraph 4.5.2.

*11.5.3 With same conditions as in Paragraph 11.5.2.1, record Pm values at which integration starts and stops. They must be within limits shown.

Nc	Pm	
Integrating Speed	At start of Int.	1000 psi min.
	At end of Int.	275 psi max.

*12.0 Leakage Checks

*12.1.0 P_b Leakage

*12.1.1 Set: PLA = 75°
Tt2 = 59°
Nc = 3850 ±5
Pb = 184

*12.1.2 Soap solution check each joint and seal between the CDP limiter and the control Pb bellows. No evidence of leakage shall occur. Record observations.

*12.2.0 External and Overboard Drain Leakage

*12.2.1 Set: PLA = 65°
Tt2 = 59°F
Nc = 3710 ±5
Pb = 150 psia.

*12.2.2 Using an air hose, remove all traces of fule from the exterior surfaces of the control. Increase Pf3 to 950 ±10 psi and Pf1 to 150 ±10 psi for 5 minutes.

*12.2.3 There shall be no external leakage and a maximum of 50 drops per minute. Overboard Drain Leakage.

*12.2.4 Pressurize overboard drain system to 40 psig for five minutes. External leakage shall not exceed 8 drops/min at each of the following locations:

CBA shaft
Power Lever shaft
Other areas shall have no leakage.

*12.2.5 The term "no leakage" shall be defined as a permissible visual appearance of fluid on the external surface of a control which does not become progressively greater during the prescribed period of time of this test (5 minutes) to such a degree that fluid runs off the surface of the control or forms droplets.

*13.0 Audit Test

*13.1 Lockwire Control as required.

*13.2 At the following audit set points record as required.

*13.2.1 Minimum Ratio Line Check
Set: PLA = 15°
Tt2 = 59°F
Nc = 3300 ±2 rpm
Pf1 = 100 ±5 psi
Record Wf at Pb = 40 psia, Pb = 150 psia and hysteresis at Pb = 40 psia. (Ref. Par. 10.1.1

*13.2.2 Maximum Ratio Line Check - Set: PLA = 75°
Nc = 3553 rpm
Tt2 = 59°F
Pf1 = 100 ±5 psi.
Record Wf at Pb = 20 psia, Pb = 150 psia
(Ref. Par. 10.1.2).

*13.2.3 Starting Accel. Limiting and Mil Droop - Set the following conditions and record Wf as required: (Para 10.2.1, 10.3.2 and 10.5.1.)

Tt2	PLA *	Pb	Pf3	Pf1	Nc	Wf
59°	75°	15.5	240	40	815	Record
59°	75°	40	315	60	2214	
59°	75°	100	525	100	3262	
59°	75°	110	595	120	3850	

*13.2.4 Idle Droop - Set the following conditions:

PLA = 15°
Nc = 1980 ±2
Tt2 = 59°
Pf1 = 55 psi
Pb = 25 psia.

Record Wf. Increase speed to Nc = 2040 ±10 then dec. to Nc = 1980 ±2 and record Wf as Idle Droop Hysteresis (Ref. Para 10.6.1).

*13.2.5 Military Droop Bias - Set the conditions marked (A) in Appendix F Record Wf. (Ref. Para 10.4)

*13.2.6 Integrating System - Set the following conditions and record at speed which integration takes place (Ref. Para 4.5.2)

PLA	Pb	Tt2	Pt2	Nc
75°	60	59°	14.7	
75°	60	300°	14.7	

*13.2.7 Compressor Bleed Actuator
Set the following conditions: PLA = 75°
Tt2 = 59°F
Pb = 50 psia
Increase speed until the CBA output shaft rotates fully in the CCW direction. Record Nc at which motion occurs. (Ref. Para. 11.3.0)

*14.0 Preservation and Storage

At the conclusion of performance testing, drain the calibration fluid from the control and prepare the control for shipment in accordance with HS Specification 380.

CBA INTEGRATION & MIL Wf VERSUS Tt2
(Appendix A)
(Para. 4.0, 5.0)

PLA	Tt2	Pb	Pt2	Pf1	Pf3	CBA Nc Cl.	CBA Nc C.Lim	CBA Nc Cl. Hys.	CBA Nc Open Hys.	Reset Pf1	Nc Set	P	Wf	Wf. Lim. at 100°F	Wf Lim. at 440°F	Int. Nc Inc.	Int. Nc Dec.	Wf Nc Inc.	Int. Nc Lim.
75	59	110	14.7	100*	610	Rec	3338 3274	Rec	28-72	125	3850	Rec	Rec	21230 21890	21120 22000	Rec	Rec	Rec	3908 3791
	150	95	13.0	125*	530	Rec	3909 3833	Rec	28-148	135	4083			16706 17276	16611 17371				4144 4022
	415	90	21.7	-	470	-	-	-	-	125	3893			13698 14238	13608 14328				3932 3853
	750	18	6.8	-	240	-	-	-	-	135	3862			2121 2229	2103 2247				3900 3824
	415	14.7	3.5	-	250	-	-	-	-	125	3893			2237 2326	2223 2340				3932 3853
	150	20	2.4	125*	240	Rec	3909 3833	Rec	28-148	135	4083			3517 3637	3497 3657				4144 4022
	59	20	2.3	100*	250	Rec	3338 3274	Rec	28-72	125	3850			3860 3980	3840 4000				3908 3791
	0	44	2.3	90*	340	Rec	-	Rec	-	110	3623			7832 8096	7788 8140				3696 3585
75	59	50	7.2	100*	375	Rec	3338 3274	Rec	28-72	125	3850	Rec	Rec	9650 9950	9600 10000	Rec	Rec	Rec	3908 3791

*Set Pf1 to 60 psi or lower before setting this value.

Tt2 FAILSAFE CHECK

(Para. 4.2.2)
Appendix B-1

Low Temperature Failsafe

Connect Pf1 to Min. Flow Standpipe

PLA	Ne	Pb	Pf1	Pf3	(Reference) Ratio Units	Wf
75	1048	20	40	175	76.96	1419 - 1659
75	1514	20	45	175	121.65	2313 - 2553
75	1980	40	55	305	173.26	6690 - 7170
75	2505	60	70	385	176.77	10245 - 10965
75	3029	100	90	500	145.15	13915 - 15115
75	3495	100	105	475	130.00	12400 - 13600
75	4019	100	135	475	127.07	12105 - 13305

Appendix B -2

High Temperature Failsafe

Connect Pf1 to Min. Flow Standpipe

75	1048	20	40	175	76.87	1417 - 1657
75	1514	20	45	175	121.65	2313 - 2553
75	1980	40	55	305	173.26	6690 - 7170
75	2505	60	70	385	*176.77 - 176.93	10255 - 10965
75	3029	100	90	500	*145.15 - 139.96	13990 - 15115
75	3495	100	105	475	*130. - 123.89	11790 - 13600
75	4019	100	135	475	127.07	12105 - 13305

* These values reflect minimum and maximum cam rotation due to tolerance.

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APPENDIX C
Para. 8.0

BODY PRESSURE, BYPASS FLOW AND BACK PRESSURE SENSITIVITY

	PLA Deg.	Tt2 °F	Nc RPM	Pb psia	Pf1 psi	Total Flow PPH	Pf3 psi	Wf PPH	
Body Pressure Sensitivity									
1.	75°	59	3800	20	170	38,000±500	290	Within 60 pph of item 2	Record
2.	75°	59	3800	20	135	38,000±500	255	Record	Record
3.	75°	59	3800	20	90	38,000±500	210	Within 70 pph of item 2	Record
4.	75°	59	3800	100	170	38,000±500	460	Within 100 of item 5	Record
5.	75°	59	3800	100	135	38,000±500	425	Record	Record
6.	75°	59	3800	100	90	38,000±500	380	Within 100 of item 5	Record
Bypass Flow Sensitivity (High Altitude Effect)									
1.	75°	59	3800	20	120	10,000±500	225	Record	Record
2.	75°	59	3800	20	120	20,000±500	225	Within 30pph of item 1	Record
3.	75°	59	3800	20	120	30,000±500	225	Within 60 pph of item 1	Record
4.	75°	59	3800	20	120	40,000±500	225	Within 90 pph of item 1	Record
5.	75°	59	3800	50	120	15,000±500	350	Record	Record
6.	75°	59	3800	50	120	20,000±500	350	Within 50 pph of item 5	Record
7.	75°	59	3800	50	120	30,000±500	350	Within 60 pph of item 5	Record
8.	75°	59	3800	50	120	40,000±500	350	Within 90 pph of item 5	Record

The difference between any two consecutive Wf/Pb values recorded at points 1 through 8 must not be greater than ±3 percent.

Back Pressure Sensitivity								
1.	75°	59	3800	100	120	38,000	400	Record
2.	75°	59	3800	100	120	38,000	600	Within 150 pph of item 1
3.	75°	59	3800	100	120	38,000	800	Within 250 pph of item 1

APPENDIX D

Para. 10.2.0

STARTING SCHEDULE

PLA (deg)	Tt2	Pb (psia)	Pf3 (psi)	Pf1 (psi)	Nc (rpm)	Ratio Units (ref)	Wf (pph)
15	59°	15.5	170	40	815	61.4	1150 - 1250
15	59°	16.5	170	40	990	72.4	1150 - 1290
15	59°	18.0	180	40	1165	87.0	1530 - 1675
15	59°	19.5	195	40	1398	111.0	2125 - 2280
15	59°	20.5	205	45	1515	121.7	2455 - 2620
15	59°	22.0	210	45	1631	130.8	2830 - 3010

APPENDIX E

Para. 10.3.0

ACCELERATION AND TOPPING SCHEDULE

Tt2 (°F)	PLA (deg)	Pb (psia)	Pf1 (psi)	Pf3 (psi)	Nc (rpm)	Ratio Units (ref)	Wf (pph)
59°	75°	20	40	170	990	72.4	1330 - 1570
59°	75°	20	40	180	1165	87.1	1620 - 1860
59°	75°	20	45	210	1515	121.7	2315 - 2555
59°	75°	25	50	260	1864	160.7	3870 - 4170
59°	75°	40	60	320	2214	181.0	7000 - 7480
59°	75°	60	75	400	2680	186.8	10850 - 11570
59°	75°	100	90	540	3029	172.0	16600 - 17800
59°	75°	100	95	510	3262	158.0	15200 - 16400
59°	75°	100	110	575	3553	178.3	17230 - 18430
59°	75°	110	150	575	4311-4427	169	18600
59°	75°	120	150	550	4369-4485	140	16800
59°	75°	160	40	700	0*	161	24100 - 26700

* Sst Wf Total = 40,000 ±2000 pph for this point only.

APPENDIX F
Accel. Bias, Mil Wf, Mil Nc, and Topping vs. Tt2
(Para. 10.4)

Code
B - Accel Bias
F - Mil Wf
S - Mil Set Speed
T - Topping

Code	Tt2	Nc	Pb	Pt2	Pf1	Pf3	Record Wf	Wf Limits	Int. Nc	Nc Limits
B	59°	2913	50	14.7	85	370		8715 - 9315		
F	59°	3850	110	14.7	120	610		21230 - 21890		
S	59		110	14.7	120	610				3791 - 3908
B	150	2913	35	21.7	85	325		7100 - 7515		
F	150	4083	142	21.7	140	690		24950 - 25800		
S	150		142	21.7	140	690				4022 - 4144
F	150	4083	95	13	140	525		16706 - 17276		
S	150		95	13	140	525				4022 - 4144
F	300A	3981	83	15	130	460		13462 - 13962		
F	300	3981	71	15	130	430		11516 - 11942		
S	300		71	15	130	430				3944 - 4022
F	415	3893	90	21.7	120	470		13698 - 14,238		
S	415		90	21.7	120	470				3853 - 3932
B	550	2913	25	18	85	260		4090 - 4390		
F	550	3882	60	18	120	360		8160 - 8520		
S	550		60	18	120	360				3845 - 3920
T	550		50	18	150	310	5700			4252 - 4369

APPENDIX F (cont.)

Code	Tt2	Nc	Pb	Pt2	Pf1	Pf3	Record Wf	Wf Limits	Int. Nc	Nc Limits
T	550		50	18	150	265	4200			4311- 4427
B	750	2913	20	12	85	220		2860 - 3100		
F	750	3862	28	12	120	240		3300 - 3470		
S	750		28	12	120	240				3824 - 3900
F	750	3862	18	6.8	120	240		2121 - 2229		
S	750		18	6.8	120	240				3824 - 3900
F	415	3893	14.7	3.5	130	250		2237 - 2326		
S	415		14.7	3.5	130	250				3852 - 3932
F	300	3981	25	3.1	130	250		4055 - 4205		
F	300	3981	18	3.1	130	250		2920 -3028		
S	300		18	3.1	130	250				3944 - 4022
F	150	4083	20	2.4	140	260		3517 - 3637		
S	150		20	2.4	140	260				4022 - 4144
F	59	3850	20	2.3	120	240		3860 - 3980		
S	59		20	2.3	120	240				3791 - 3908
B	-65	2913	70	2.3	85	390		9110 - 9950		
B	0	2913	60	2.3	85	380		8875 - 9595		
F	0A	3623	44	2.3	110	320		7832 - 8096		
S	0		44	2.3	110	320				3585 - 3696
F	59	3850	50	7.2	120	375		9650 - 9950		
S	59		50	7.2	120	375				3791 - 3908

APPENDIX G

Para. 10.5.0

MILITARY AND IDLE DROOPS

	PLA (deg)	Tt2 (°F)	Pb (psia)	Pfl(Ref) (psi)	Nc (rpm)	Direction of Approaching Nc	Wf (pph)
	APPENDIX H IDLE DROOP						
1.	15	59	25	55	1922±2	Increase	610-930 more than item 2
2.	15	59	25	55	1980±2	Increase	3150-3350
3.	15	59	25	55	2039±2	Increase	705-1025 less than item 2
4.	Increase Nc to 3800 rpm						
5.	15	59	25	55	1980±2	Decrease	Within ±205 of item 2
6.	15	59	25	55	1922±2	Decrease	Within ±205 of item 1
	MILITARY DROOP						
1.	75	59	110	120	3740±2	Increase	295-510 more than item 3
2.	75	59	110	120	3790±2	Increase	155-270 more than item 3
3.	75	59	110	120	3850±2	Increase	21230-21890
4.	75	59	110	120	3900±2	Increase	145-250 less than item 3
5.	75	59	110	120	3940±2	Increase	240-415 less than item 3
6.	75	59	110	120	3850±2	Decrease	Within ±215 of item 3

APPENDIX H

Idle Wf versus Tt2

(Para. 10.6)

PLA	Tt2	Nc	Pb	Pf1	Pf3	Limits of Wf
15	-65	1980	25	55	205	2,630 - 2,830
15	0	1980	25	55	205	2,915 - 3,115
15	59	1980	25	55	205	3,150 - 3,350
15	150	1980	25	55	205	2,535 - 2,735
15	250	1980	25	55	205	3,310 - 3,510

APPENDIX J

(Para. 10.7.0)

CDP LIMITING

Pb psia	Direction of Approaching Pb	PPH Min	PPH Max
184	Inc.	35,500	36,600
186	Inc.	31,300	36,800
188	Inc.	23,100	36,800
192	Inc.	12,000	19,900
186	Dec.	31,300	36,800
184	Dec.	35,500	36,600

APPENDIX K
Para. 11.2
AREA PROPORTIONAL SYSTEM SLOPE

Appendix K-1

Nc RPM	Wfm Limits (pph)
3670	319 to 433 less than Wfm recorded at 3850 Nc
3790	Record
3850	Record
3905	Record
4020	334 to 454 more than Wfm recorded at 3850 Nc

Appendix K-2

3745	319 to 433 less than Wfm recorded at 3850 Nc
3850	Record
3945	334 to 454 more than Wfm recorded at 3850 Nc

Appendix K-3

3540	319 to 433 less than Wfm recorded at 3850 Nc
3850	Record
4150	334 to 454 more than Wfm recorded at 3850 Nc

APPENDIX L
(Ref. Paragraph 11.3) Compressor Bleed Schedule

PLA	Pb	Tt2	Limits of Nc "Bleeds Close"	Limit of Nc for Bleeds Open	Hysteresis for Bleeds Open	Hysteresis for Bleeds Close
65	50	-65° F	2877 - 2936	3961 max.	28 to 72 rpm from open rpm	28 to 72 rpm from close rpm
65	50	59° F	3274 - 3338	4296 max.	28 to 72 rpm from open rpm	28 to 72 rpm from close rpm
65	50	150° F	3833 - 3909			28 to 148 rpm from close rpm
65	50	250° F	4179 - 4261			28 to 100 rpm from close rpm.
						28 to 100 rpm from close rpm.

APPENDIX M

Curve Number	Name	Applicable Para.
F-5690	Proportional Gain	11.1, 11.2
F-5691	Tt2 Failsafe	4.2.2
F-5692	Min Ratio, Min Flow	4.3, 5.2, 5.6.1 5.6.2, 10.1.1
F-5693	Max Ratio	4.4, 5.3, 5.6.1 5.6.2, 10.1.1
F-5694	Starting Accel and Topping	10.2, 10.3
F-5695	Accel Bias	10.4
F-5696	Pressure Sensitivity	8.0
F-5697	Power Lever	9.3
F-5698	Sequencing Valve	9.4
F-5099	Idle and Military Droop, Idle Bias	10.5, 10.6
F-5700	Military Droop Bias	4.5.3, 5.4.3, 5.6.1, 5.6.2, 10.6, 10.4
F-5701	Integrating Speed	4.5.2, 5.4.2, 5.6.1 5.6.2, 10.4
F-5702	Compressor Bleed Actuator	4.5, 4.5.1, 5.4.1, 11.3, 11.4
F-5703	CDP Limiter	10.7

Non-Plottable

Remote Trimmer	4.2.1
Trimmer Range	4.6 5.5 9.1
Proof Pressure	9.2 9.5
P.L. Torque	12.0
Max Control Pressure Drop	
Leakage	

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FIGURE 1
INTEGRATION PROPORTIONAL GAIN
(PARA. 11.1, 10.4)

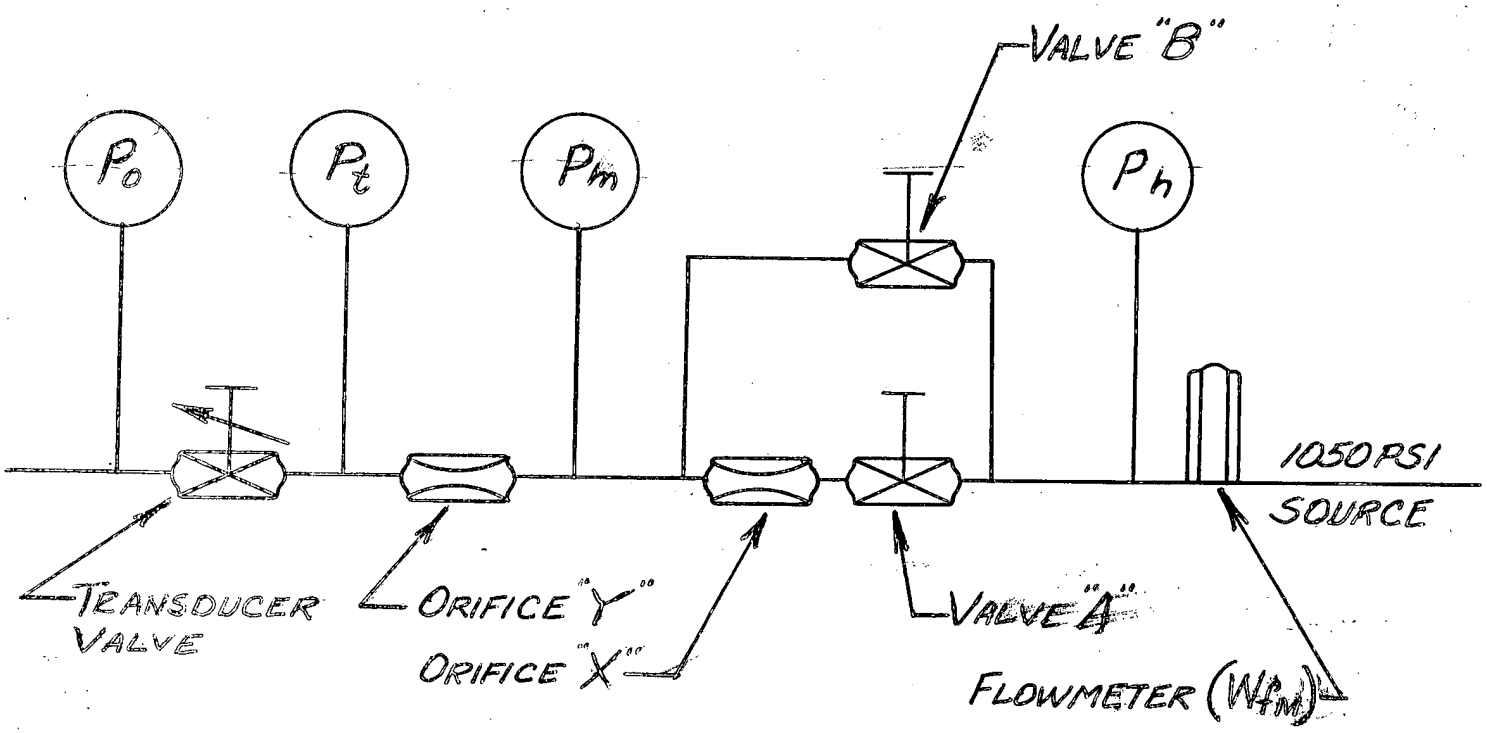


FIGURE 2

SEQUENCING VALVE

(PARA. 9.4)

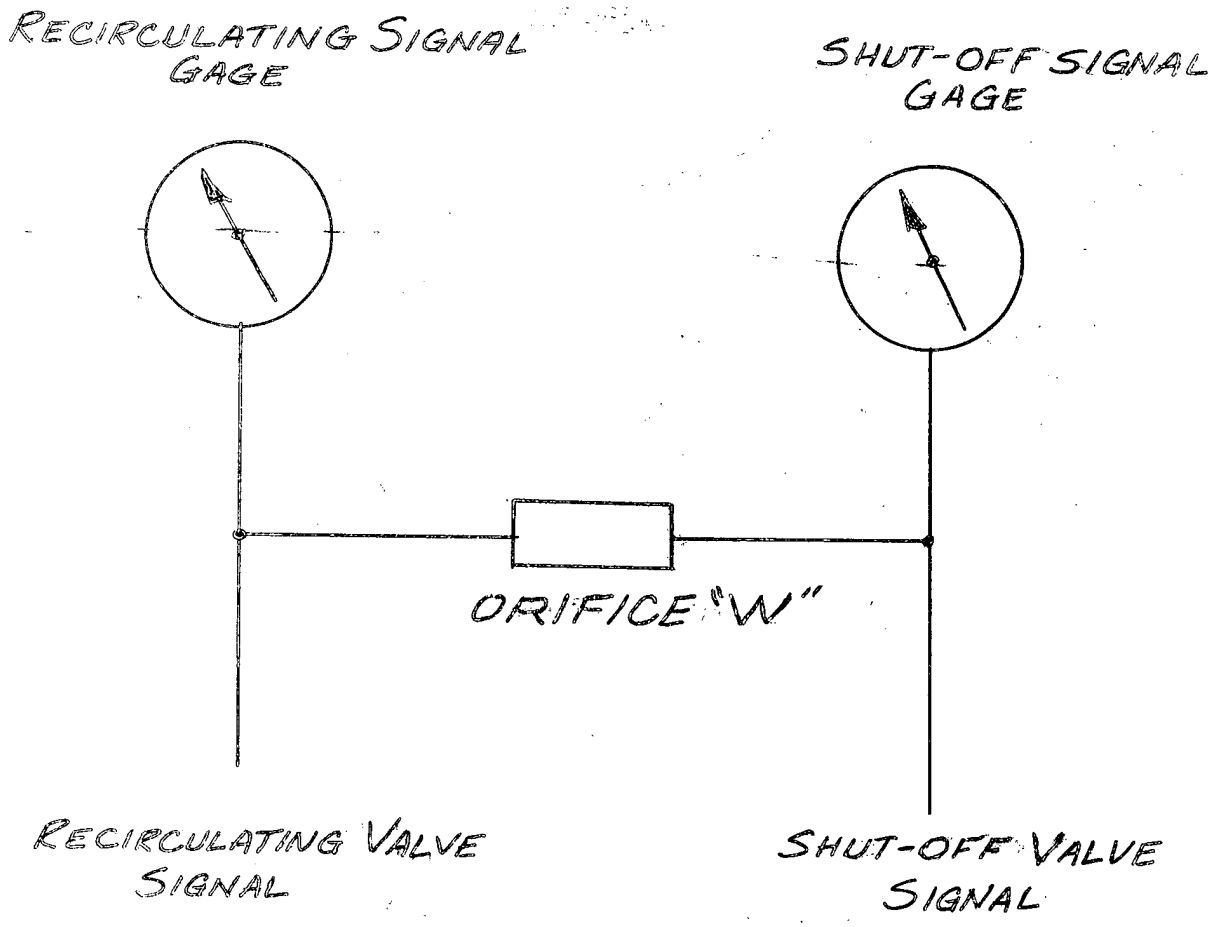
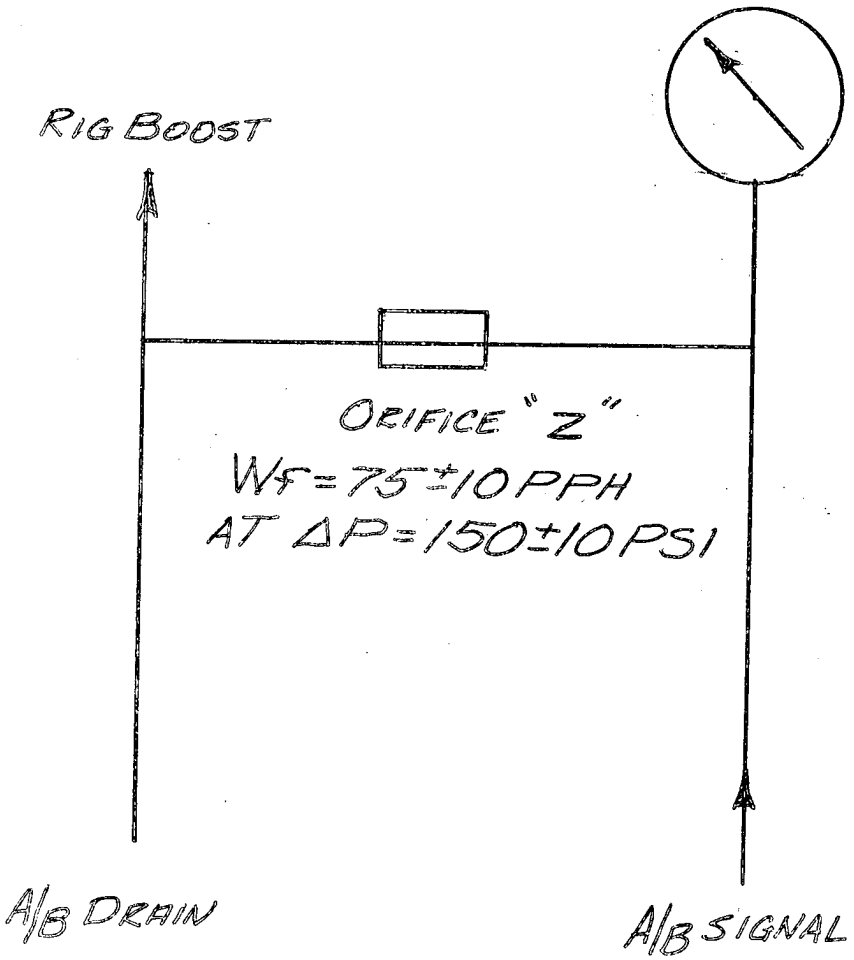
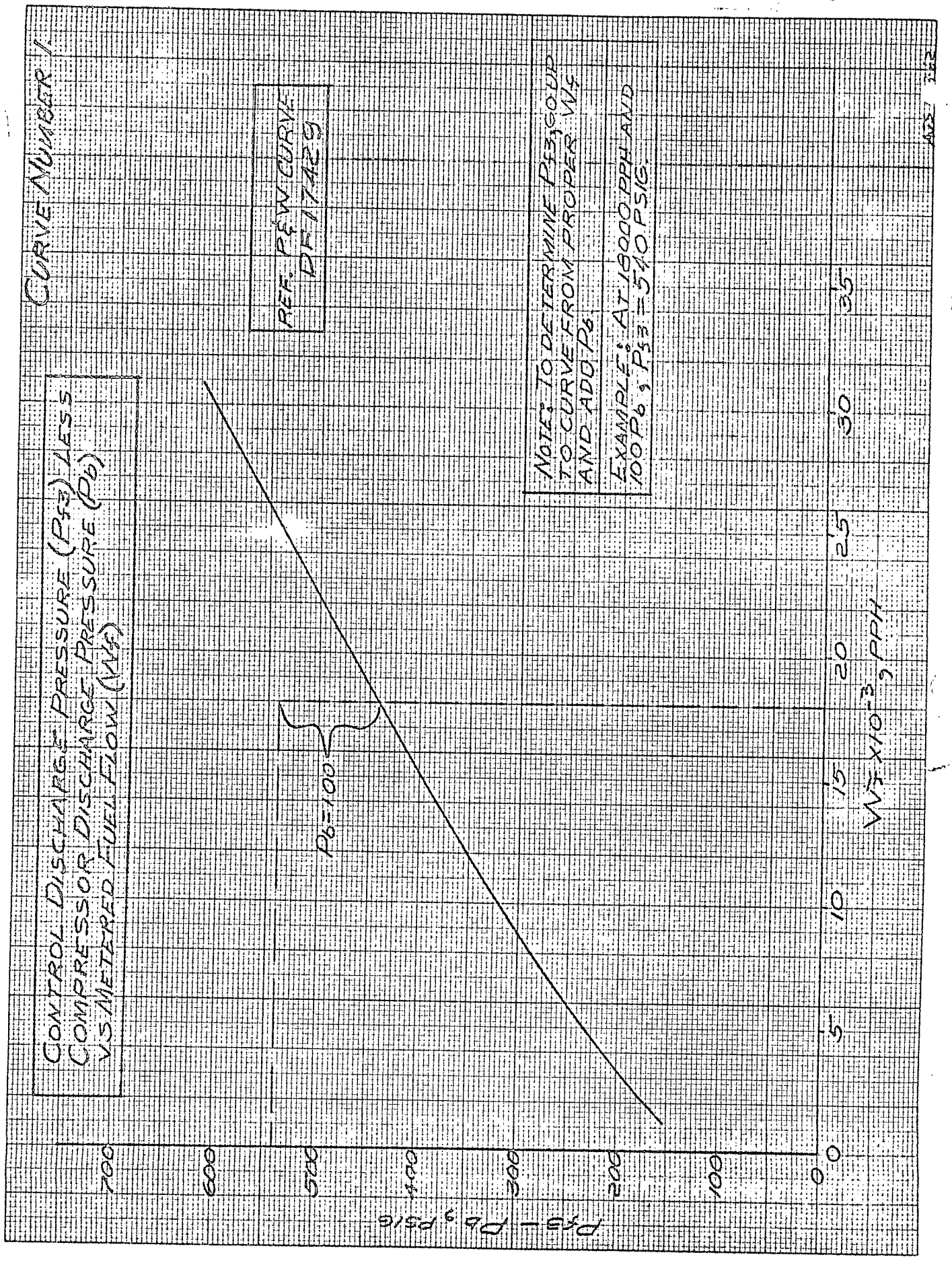
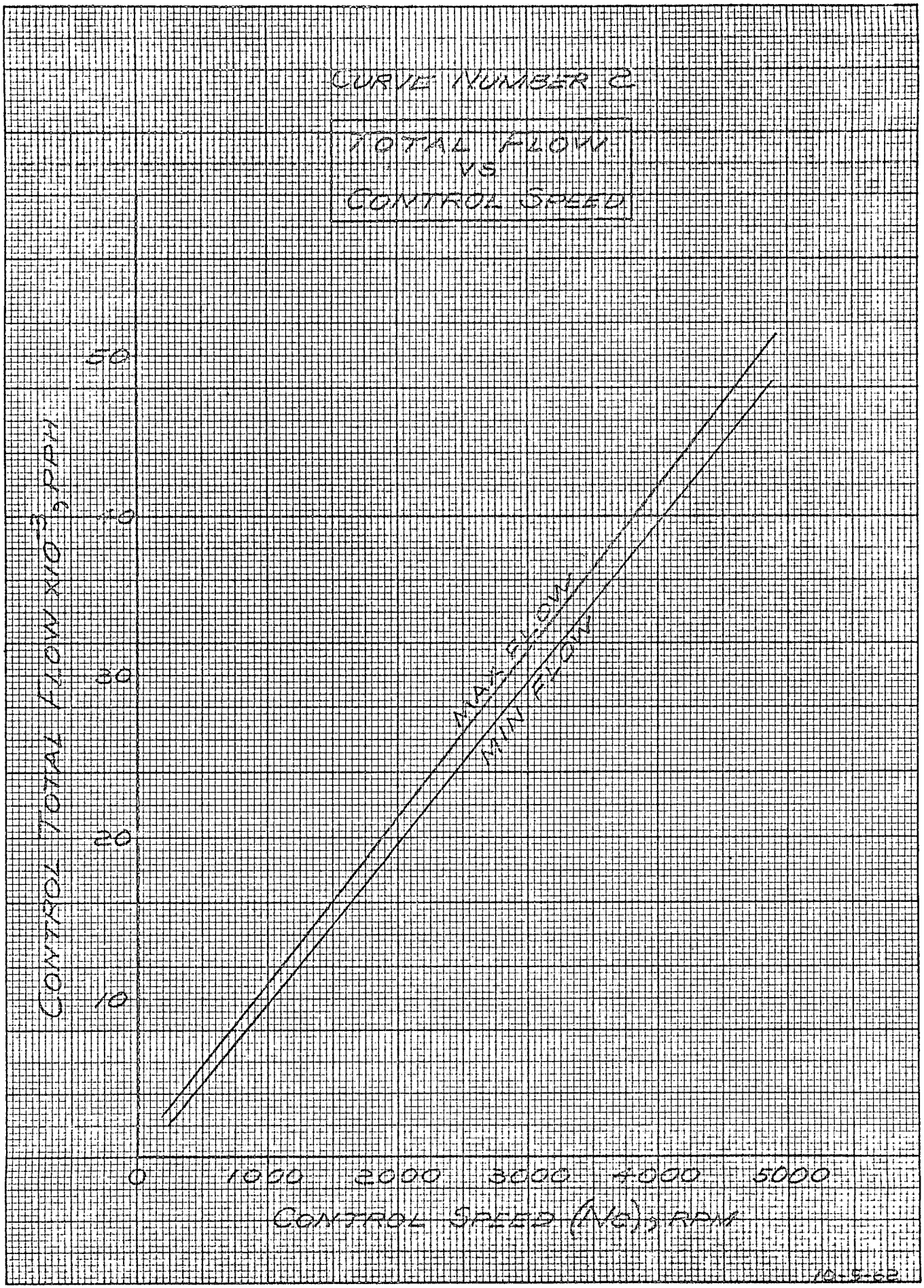
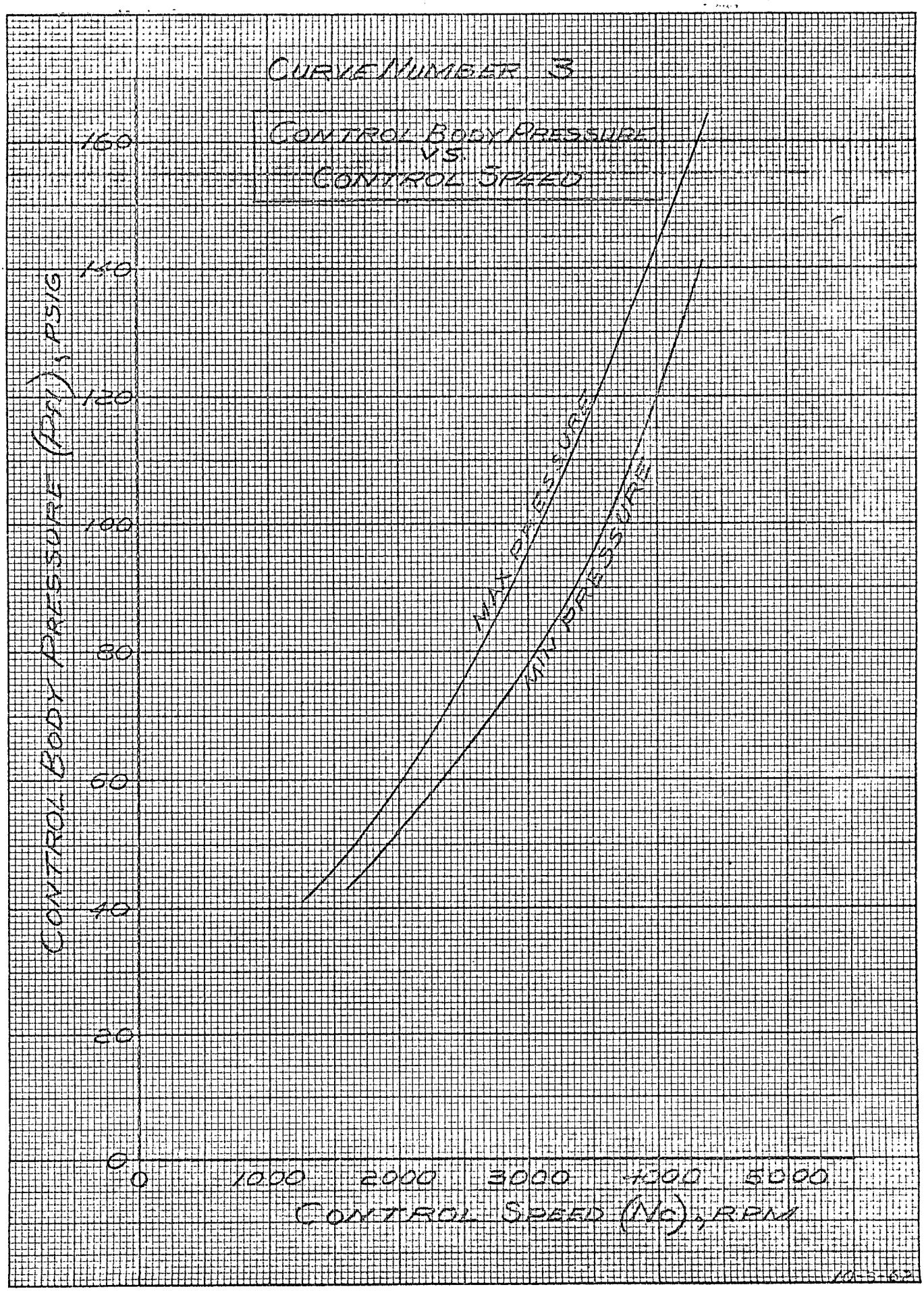


FIGURE 3
A/B SIGNAL
(PARA 11.5.1)









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1.0 GENERAL INFORMATION

1.1 Annulments

This specification supercedes all previous qualifications and/or letters of instruction covering these assemblies.

1.2 Scope

1.2.1 Where noted on the assembly drawing, this specification defines the methods of calibrating and testing for acceptability of applicable JFC-47 Linkage Components furnished as spares or assembled into Fuel Controls at HSD.

1.3 Test Requirements

1.3.1 Unless otherwise specified, all pressures are gage.

1.3.2 This specification defines a test procedure for determining the position of the Pb Input Lever which will produce the minimum pressure effect from the sealing bellows. The procedure defined in Para. 2.4 thru 2.5.2 is a suggested procedure for determining this point. The test in Para. 2.5.3 proves that minimum pressure sensitivity point has been found.

The calculation of net weight -w- at the minimum pressure sensitivity position is necessary to insure that the torque imposed by the bellows and flexure springs does not exceed the range of the fuel control adjustments.

The pivot contact test is required to insure that the lever pivots are seated at the minimum operating load when the lever is in the minimum pressure sensitivity position.

1.4 Equipment Required

1.4.1 Tools which permit proper assembly of components and plumbing of test fixtures.

1.4.2 Necessary fixture as described in Appendices.

1.4.3 Pneumatic pressure source capable of maintaining for a minimum period of 1/2 hour any set pressure, within ±2 psi, between 0 and 200 psi.

1.4.4 Pressure gages -

One gage, 0-200 psi, ± 2.5% accuracy.

1.4.5 Measuring gages -

One 12 inch height gage, .0001 accuracy.

1.4.6 Dial indicators -

One 1 inch stroke, .0001 accuracy.

1.4.7 Set of weights, one quarter (¼) lb. subdivisions, four (4) lb. total. Weights are to be accurate within 1%.

1.4.8 One 25 lb. scale, accurate to one ounce.

1.4.9 Set of weights, one ounce subdivisions, one quarter (¼) lb. total, weights are to be accurate within 1%.

2.0 PJ Lever Assembly (Reference - Appendix A schematic).

2.1 Measure and record dimension e to nearest .005 inch. Dimension c will equal 1.233 ± .004 from detail drawings. Determine dimension d from the equation d = e - 1.233. Calculate and record dimension d.

2.1.1 Weigh and record actual weight of 10±0.5 lb. weight plus its lever attachment fixtures. Secure the lever attachment fixture at point E.

2.2 Mount PJ lever assembly onto .094 DIA dowel pins and secure the lever assembly to the fixture.

2.3 Attach a 10 ± 0.5 weight at point E, adjusting the weight stop such that the 10 lb. weight is just beginning to act on the lever.

2.3.1 Attach the dial indicator with its probe on the .093 dia. pin. at point B.

2.3.2 Attach the weigh pan on the .093 dia. pin. Back off the weight stop approximately .100 inch. Add weight to weigh pan such that a parallel or "null" condition is reached (i.e. - dimension a equals dimension b within .0005 inch).

2.3.3 Record total "null" weight (this weight includes everything attached to point B).

2.3.4 Zero the dial indicator at "null".

2.4 Install sealing cover and set Pd = 50 psi.

2.4.1 Add 2 lb. weight to the "null" weight. Record displacement of point B. Decrease weight by 4 lb. in ¼ lb. increments, recording displacement of point B at each set point.

2.4.2 Set Pd = 0. Add 2 lb. to establish "null". Hand adjustment of weigh pan may be necessary to obtain the null point. This hand adjustment will remove any residual friction forces in the pivots.

2.4.3 Repeat 2.4.1 at Pd = 100 psi.

2.4.4 Repeat 2.4.2

2.4.5 Repeat 2.4.1 at Pd = 150 psi.

2.4.6 Repeat 2.4.2

2.5 Plot W (weight added and subtracted from "null" weight) versus X (displacement of point B) for Pd = 50, 100, 150 psi. Connect the points common to each pressure with a straight line. See Appendix B for an example plot.

2.5.1 Determine position X corresponding to the intersection of the three plotted lines, or the average X corresponding to the minimum band width of the intersection of the three plotted lines. This is the point of minimum body pressure (Pd) sensitivity of the lever assembly and establishes the steady state attitude which the P3 lever must assume in the control. Also determine the total weight at point B which corresponds to position X. Record this weight.

2.5.2 If the X determined in 2.5.1 and used in 2.5.3 is greater than ± .012 inch, the lever assembly is unacceptable.

2.5.3 Verify this minimum body pressure sensitivity point as follows. At Pd = 50 psi add 2 lb. weight. Decrease weight until the dial indicator reads the X determined in 2.5.1. Increase Pd to 150 psi recording X at 50, 100, 150 psi. X must not change by more than .0005 inch. If X changes by more than .0005 inch, the lever assembly is unacceptable. Tap fixture lightly during this test to remove pivot friction effects.

2.6 Remove the P3 lever assembly. Vibrator engrave the X determined in 2.5.1 on the proper surface of the lever in this manner: X = pos. or neg. X determined in 2.5.1. Example, X = neg. .008. Vibrator engrave the net weight F determined in 2.7.2 on the proper surface of the lever in this manner: F = pos. or neg. F. Example, F = pos. .75 lb. This information will be used to install the P3 lever assembly into the Control per HS specification 508 such that the lever will be non-sensitive to body pressure.

2.6.1 Record data taken in 2.6.0, serial number of assembly (if applicable), tester's name and date on a tag and attach the tag to the assembly.

2.7 Determine the net force required at point B to obtain position X as follows.

2.7.1 Multiply the weight (pounds) recorded in 2.5.1 by dimension d (inches). Divide result by dimension g (inches).

2.7.2 Find the difference between the final result in 2.7.1 and the total weight recorded in 2.5.1. This difference F must not exceed 2 pounds. Record this net weight F. Net weight is positive if actual weight recorded in Para. 2.5.1 is greater than calculation weight in 2.7.1.

2.7.3 If net weight F obtained in 2.7.2 is greater than 2 pounds, the P3 lever assembly is unacceptable.

2.8 Determine that lever pivots are in contact with lever in optimum operating position as follows.

2.8.1 Install lever into fixture as shown in Appendix C.

2.8.2 Apply 6.0 ± 0.10# weight at point "H" on lever to simulate pivot contact loading spring.

2.8.3 Apply 1.1 ± 0.10# weight at point E on lever.

2.8.4 Adjust micrometer to move lever until dim. "a" equals dim. "b" within .002 inch. Record micrometer reading.

2.8.5 Adjust micrometer to move lever to the "X" position determined in paragraph 2.5.1. This may be done by adjusting the micrometer by the amount scribed on the lever as dimension "X". Note: Micrometer stem must be in contact with .100 dia. pin at this position.

2.8.6 With the lever in this position there must be no more than .001 gap at either of the pivots for the lever (point "G"). If gap at either pivot exceeds .001 lever is unacceptable.

3.0 P3 Lever Assembly 576053

3.1 Test 576053 for acceptability per 2.0.

4.0 P3 Lever Assembly 576096

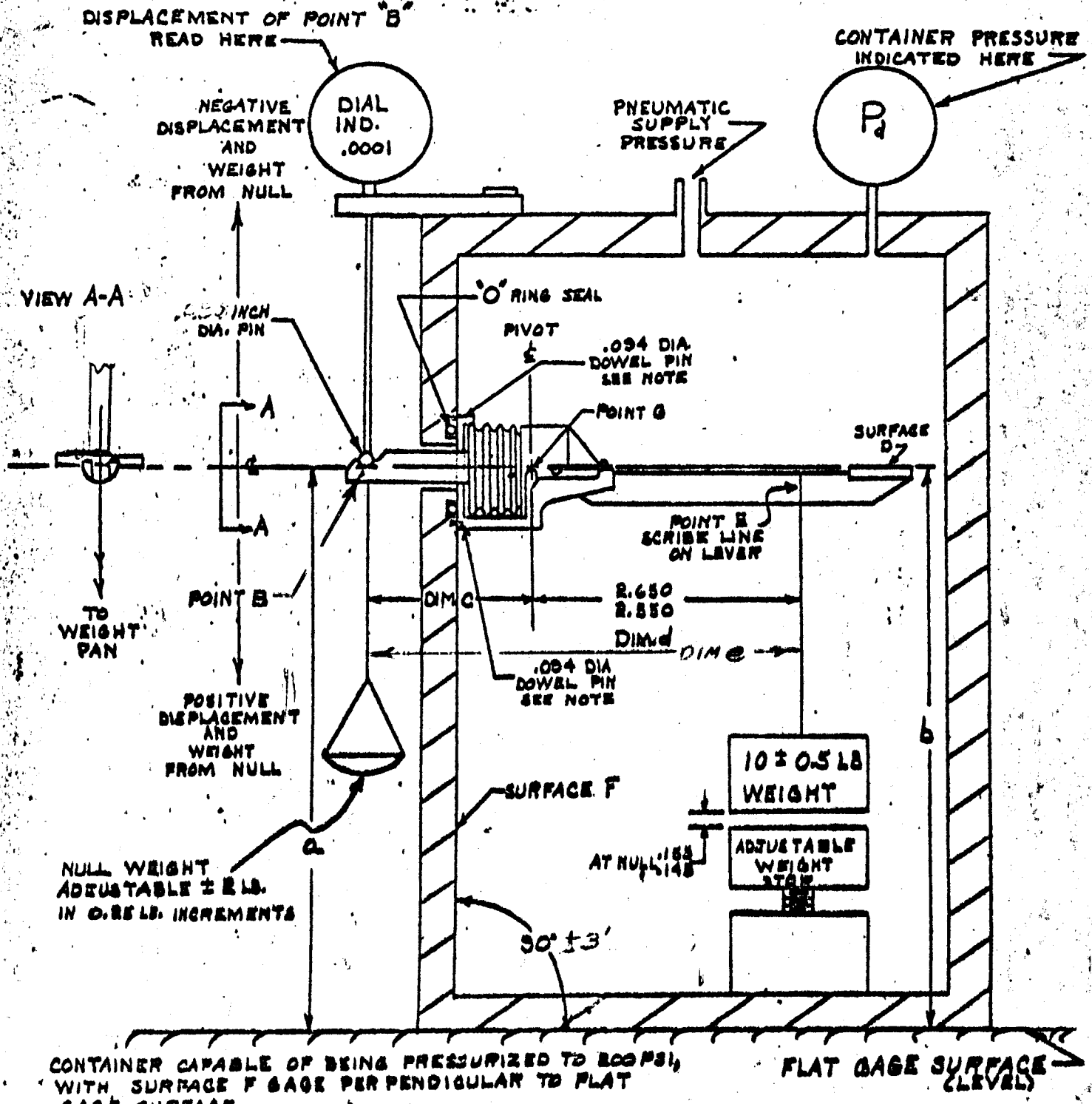
4.1 Test 576096 for acceptability per 2.0.

5.0 P3 Lever Assembly

5.1 Test 581640 for acceptability per 2.0.

APPENDIX A

JFC-47 LINKAGE COMPONENT CALIBRATION
P_3 LEVER ASSEMBLY

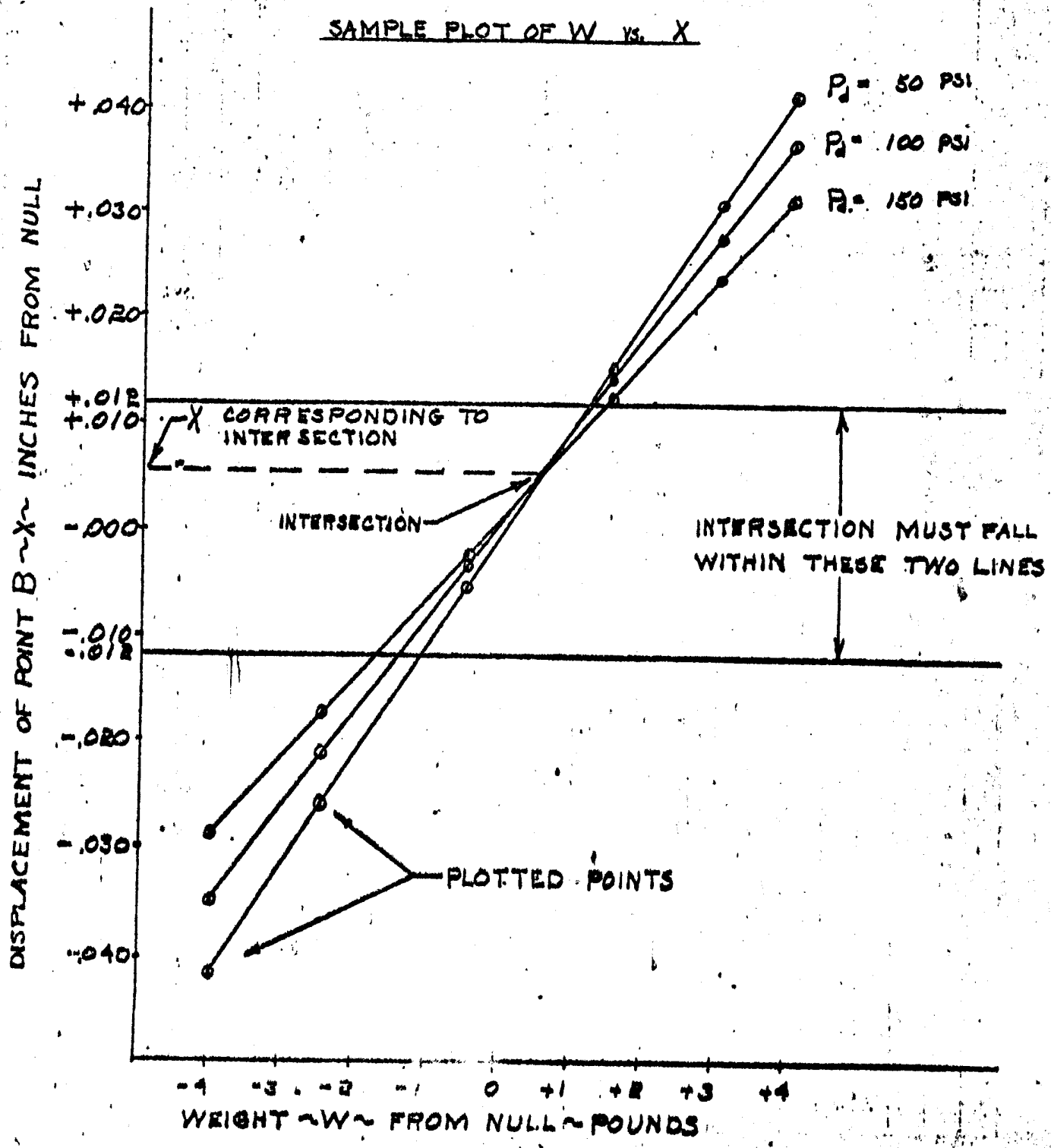


NOTE: DOWEL PIN TO BE LOCATED ON SURFACE F SUCH THAT THE UPPER DOWEL IS WITHIN .001 OF A VERTICAL PLANE PASSING THRU THE CENTER

APPENDIX B

TFC-47 LINKAGE COMPONENT CALIBRATION
R_3 LEVER ASSEMBLY

SAMPLE PLOT OF W vs. X



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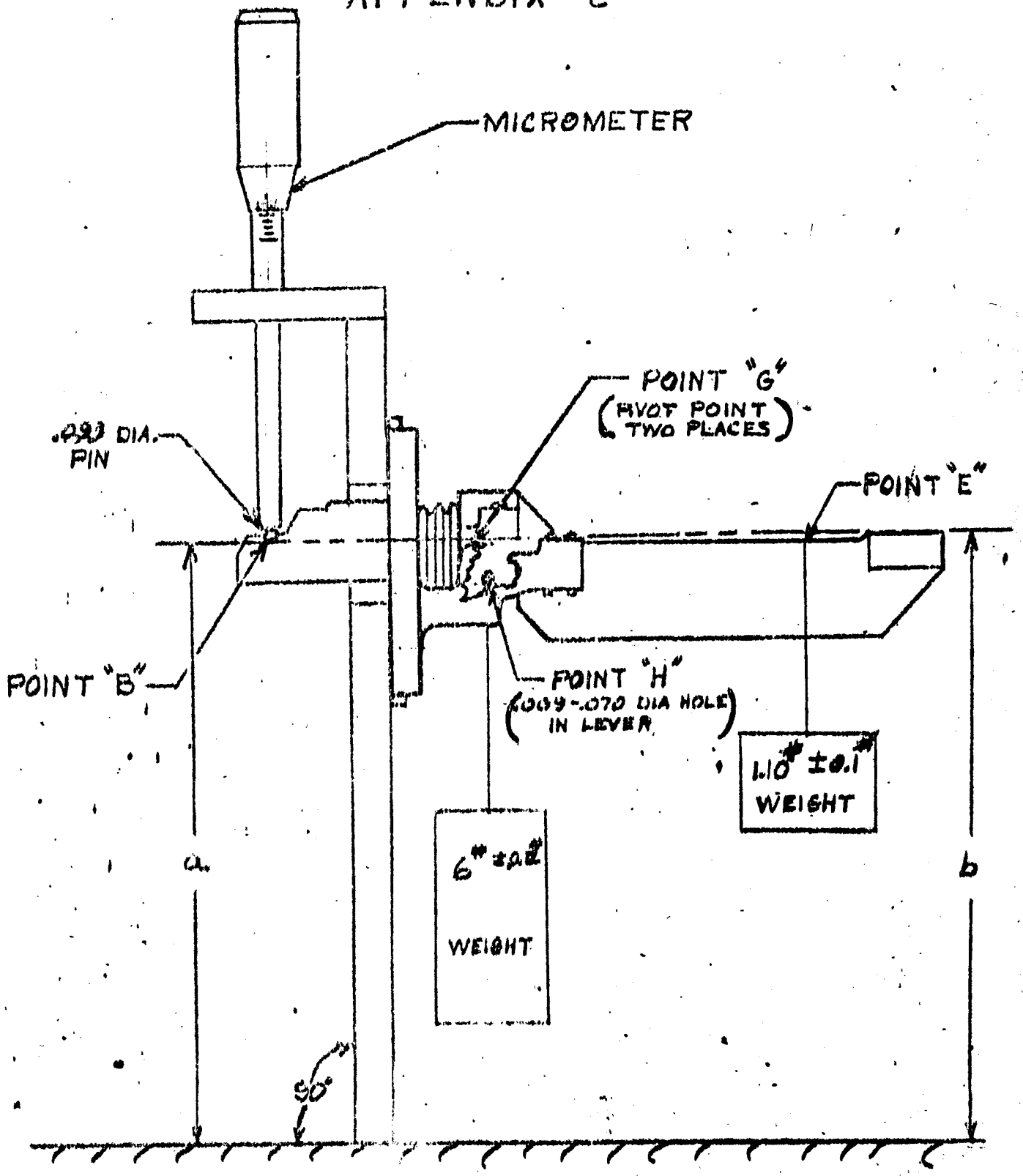
APPENDIX "C"



TEST SET-UP TO CHECK FOR PIVOT CONTACT PER PARA. 2.9

HAMILTON STANDARD
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H.S. 1558
Amend. 2
Page 1 of 1
E. C. 71281-1
Date: 4-28-62

H.S. 1558 "LINKAGE COMPONENT CALIBRATION JFC47 ACCEPTANCE OF"

Amendment 2

1. Change paragraph 2.6 to read:

"Remove the P3 lever assembly. Vibrator engrave the X determined in 2.5.1 on the proper surface of the lever in this manner: X = pos. or neg. X determined in 2.5.1. Example, X = neg. .008. Vibrator engrave the weight -w- corresponding to the X determined in 2.5.1 on the proper surface of the lever in this manner: w = pos. or neg. w corresponding to X determined in 2.5.1. Example, w = pos. 0.75 lb. This information will be used to install the P3 lever assembly into the Control per HS specification 1502 such that the lever will be non-sensitive to body pressure."

1.0 GENERAL INFORMATION

1.1 SCOPE

1.1.1 This specification covers the method of calibrating and testing the JFC-47 Tt2 sensor for temperature compensation.

1.2 Equipment Required

1.2.1 A nitrogen pressure source and regulator of 20 psig.

1.2.2 A nitrogen pressure source and regulator of 250 psig.

1.2.3 One mercury U tube manometer capable of ±25" HG.

1.2.4 One pressure gage with a range of 0-50 psi and an accuracy of 1%.

1.2.6 Fixtures:
569455-T-17
569455-T-154

1.2.7 One oven capable of 500° F and large enough to contain the JFC-47 temperature cover and associated fixtures required for conducting this test. Provisions should be made for tapping the Tt2 cover assembly from outside the oven.

1.2.8 Force indicator with a range of 0 to 5.0#.

1.3.0 Symbols

1.3.1 The following symbols will be used throughout this specification:

Ps = Simulator Pressure (psig)
Pns = Null Sensor Inlet Pressure (psig)
Pm1 = Null Sensor Metered Pressure (in Hg)
Pm2 = Null Sensor Metered Pressure (in Hg)

1.4 Test Requirements

1.4.1 The control component shall have been assembled and dry calibrated in accordance with HS 1502B and HS1503A.

2.0 Set-up and Testing of Temperature Sensor

2.1 Set-up of Fixture 569455-T-154

2.1.1 Connect the null sensor inlet pressure source (20 psig) to the null sensor assembly. (Fixture should not be mounted onto the Tt2 cover at this time.) Connect the Pm1 and Pm2 lines to the manometer and apply 20 psig to the null sensor assembly. Using the force meter, apply a 2.5# force at the Pilot Valve pin and adjust set screw A until Pm1 = Pm2. See Figures 1 and 2.

2.1.2 Loosen null sensor mounting screws B and C and install Fixture 569455-T-154 onto the Tt2 cover. Install the .501 gage block of fixture 569455-T-17 between the multiplying lever and input lever, and adjust the null sensor against the multiplying lever until Pm1 = Pm2. Lock screws B and C.

2.1.3 Install Tt2 feedback rollers onto Fixture 569455-T-154 and mount fixture onto Tt2 Cover. See Figure 1. Align pushrod and micrometer head assembly so that rollers and pushrod are parallel to and midway between the multiplying and input levers.

2.1.4 Turn and micrometer head in until the Tt2 feedback rollers contact the Tt2 multiplying lever pivot bracket. Loosen Set Screw D and adjust micrometer head to read .355".

2.2 Calibration Check of Tt2 System

2.2.1 Set micrometer at 1.10" and adjust Ps until the mercury manometer is at zero ΔP and record Ps. Using this technique, run the entire calibration schedule per Appendix A at Room Temperature. Tap the Tt2 cover and fixture assembly while taking reading. A preliminary run should be made prior to taking data, to properly seat the moving parts.

2.2.2 After completing the schedule per Para 2.2.1, review the data to determine the hysteresis at each roller position. If it is in excess of 1.5 psi over the entire range, it is caused by misalignment of the roller assembly. If this is the case, realign the roller assembly and rerun the schedule per Para 2.2.1. If hysteresis is in excess of 1.5 psi for only one or two roller positions, disregard these points and continue with testing.

2.2.3 Having satisfied the requirements of Paragraphs 2.2.1 and 2.2.2, increase the temp. to a value that is 355°F ±5°F above room temperature. Allow temperature to stabilize for 30 minutes and repeat Para 2.2.1 and 2.2.2 if necessary at this temperature.

2.2.4 Reduce temperature to room temperature and return the unit to the assembly area, together with the data, for evaluation.

2.3 Assembly Area Instructions

2.3.1 Average the hysteresis reading for each roller position for both room temperature data and high temperature data and plot both sets of data on the same sheet per the sample Curve of Appendix B. If the high temperature curve coincides with the room temperature curve, calibration is acceptable and the Tt2 cover assembly may be installed in the control as is.

2.3.2 If the high temperature curve falls above the room temperature curve, bimetallic discs must be removed from either the rate adjustment or position adjustment. If the high temperature curve falls below the room temperature curve, bimetallic discs must be added to either the rate adjustment or position adjustment.

2.3.3 If the plotted data reveals a constant shift in pressure for each roller position, bimetallic discs could be added to or subtracted from the Position Adjustment. Each disc in the position adjustment has the effect of shifting the curve .65 psi. For Example (Ref. Appendix B) Curve 2 has a shift in pressure of 1.5 psi to the high side. By dividing 1.5 by .65 ($\frac{1.5}{.65} = 2.3$) we find that it is necessary to remove 2 bimetallic discs in order to lower the curve to coincide with the room temperature curve.

2.3.4 If the plotted curve reveals a varying shift in pressure from one end of the curve to the other, bimetallic discs will have to be added or subtracted from the Rate Adjustment. To determine the amount of bimetallic discs to be added or subtracted from the rate adjustment determine the pressure shift in the curve at 73.5 psi. At this point on the curve, one disc has the effect of shifting the curve 1.4 psi ($\frac{2.2}{1.4} = 1.57$) we find that it is necessary to add 2 bimetallic discs to the rate adjustment in order to raise the curve to coincide with the room temperature curve.

2.3.5 There may be cases where the shift in calibration due to temperature is caused by the incorrect number of bimetallic discs in both the position and rate adjustments. In cases such as this, careful examination of the plotted data should reveal the extent to which each adjustment need be corrected. A trial and error method may have to be employed to correct the above situation.

2.4.0 After determining the correct amount of bimetallic discs to be added or removed from the rate and/or position adjustments, recalibrate the Tt2 servo assembly per HS 1503A and return the unit to test.

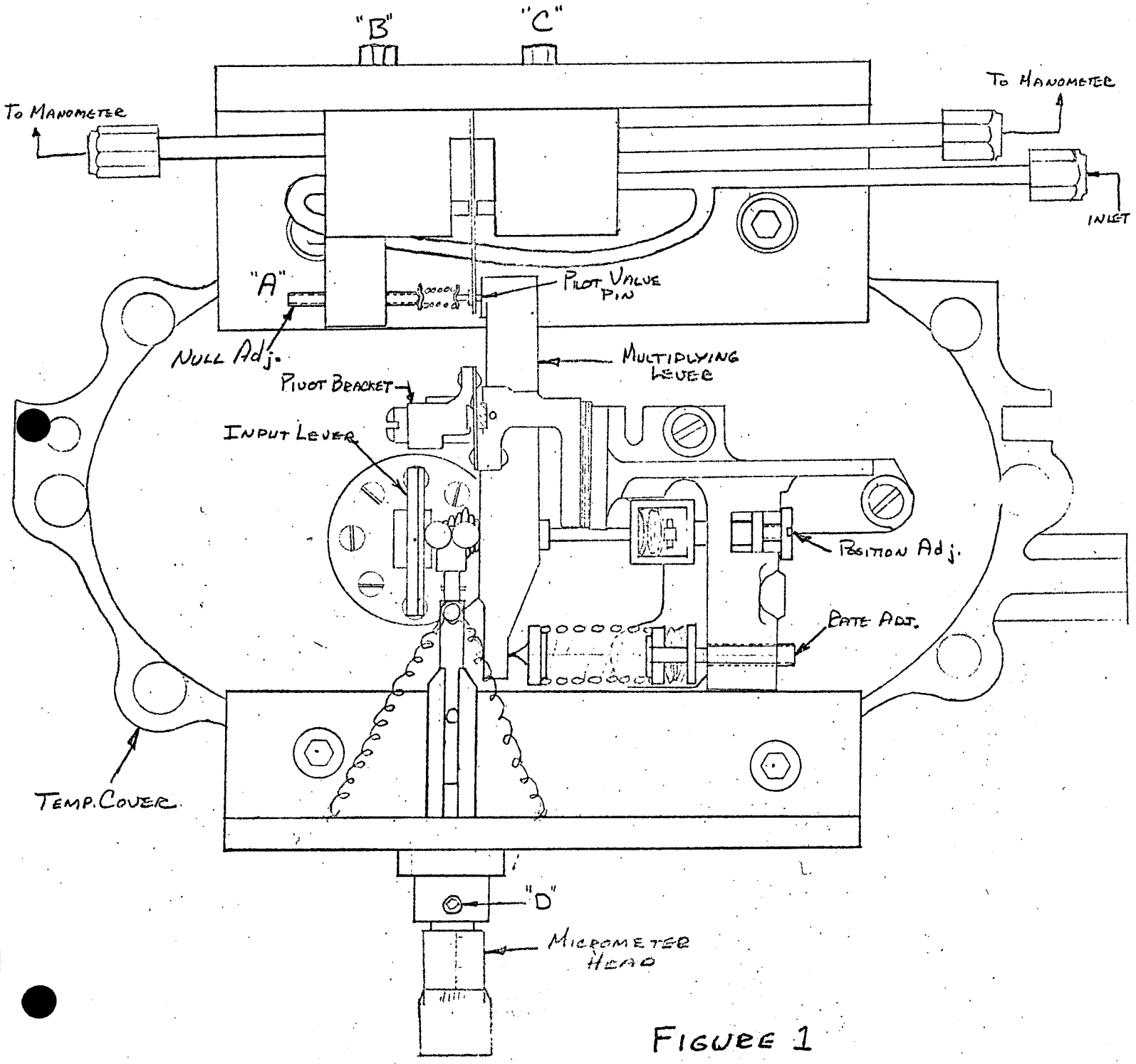


Figure 1

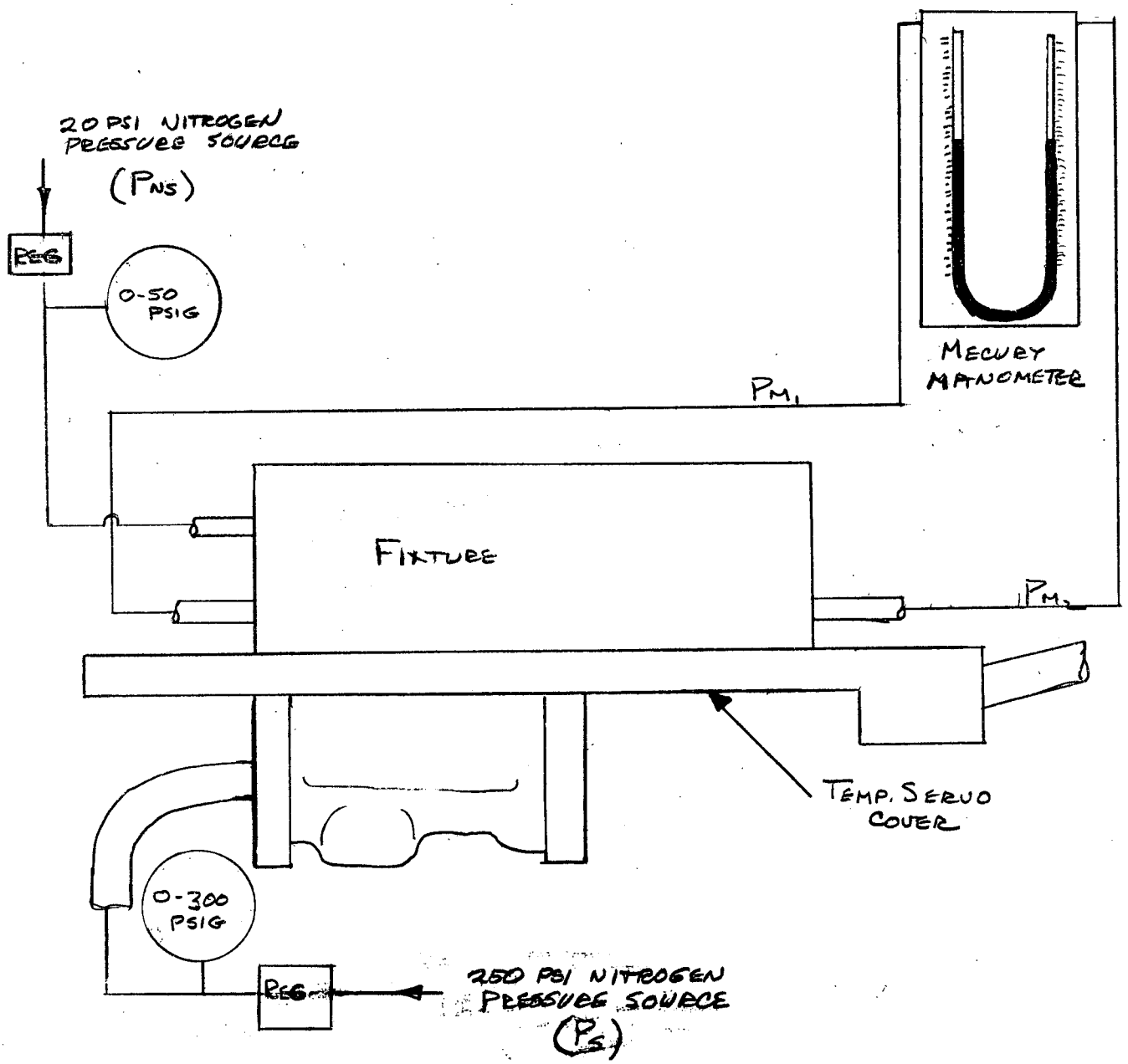


FIGURE 2.

APPENDIX A

Para. 2.2.1

Calibration of Tt2 Sensor

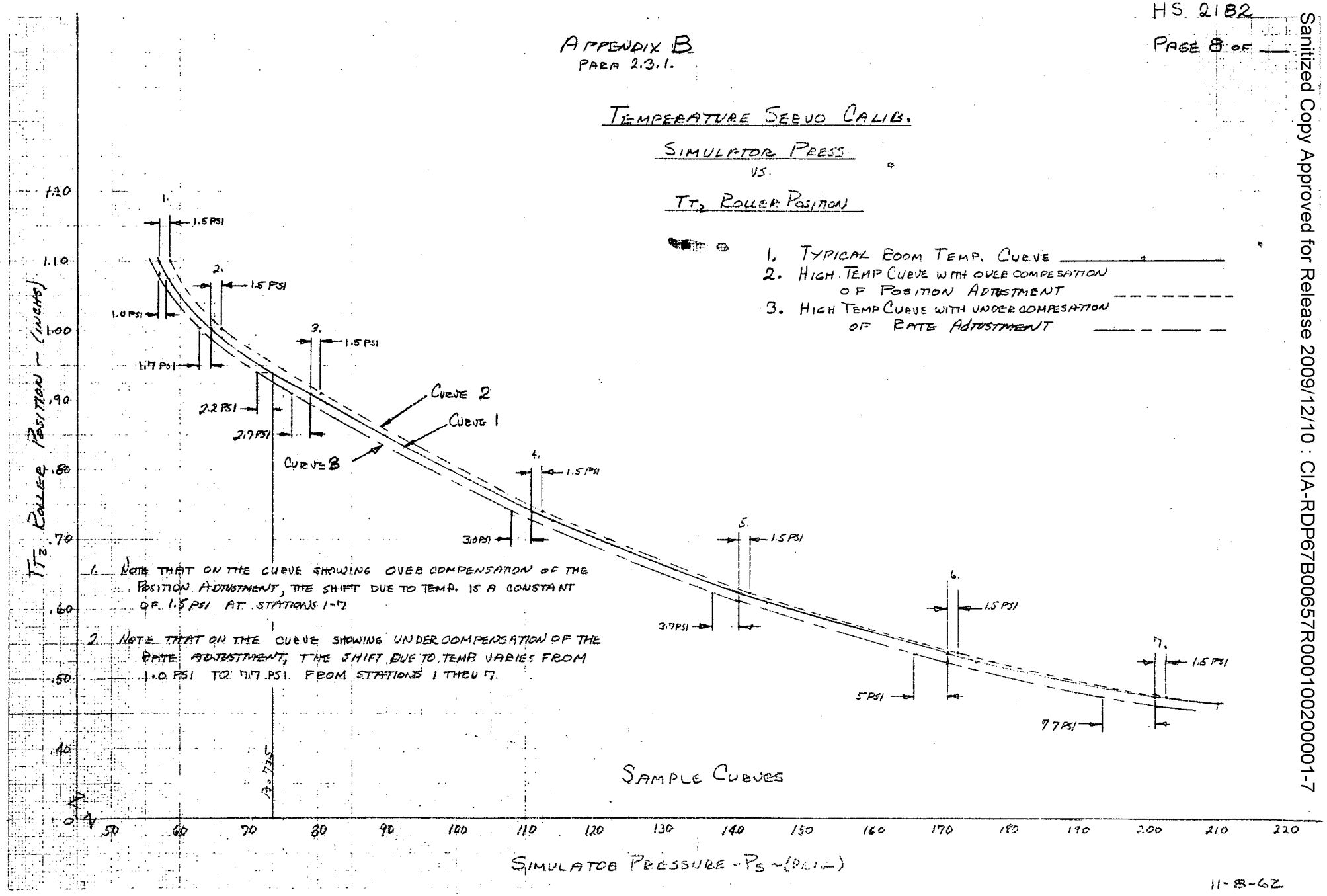
Tt2 Roller Position (inches)	Simulator Pressure (psig) Record	Temperature °F Record
1.10		
1.05		
1.00		
.95		
.90		
.85		
.80		
.75		
.70		
.65		
.60		
.55		
.50		
.45		
.50		
.55		
.60		
.65		
.70		
.75		
.80		
.85		
.90		
.95		
1.00		
1.05		
1.10		

APPENDIX B
PARA 2.3.1.

TEMPERATURE SERVO CALIB.

SIMULATOR PRESS.
VS.
T_2 ROLLER POSITION

1. TYPICAL ROOM TEMP. CURVE _____
2. HIGH TEMP CURVE WITH OVER COMPESATION OF POSITION ADJUSTMENT - - - - - - - -
3. HIGH TEMP CURVE WITH UNDER COMPESATION OF RATE ADJUSTMENT — - — - —



SAMPLE CURVES

1. NOTE THAT ON THE CURVE SHOWING OVER COMPENSATION OF THE POSITION ADJUSTMENT, THE SHIFT DUE TO TEMP. IS A CONSTANT OF 1.5 PSI AT STATIONS 1-7

2. NOTE THAT ON THE CURVE SHOWING UNDER COMPENSATION OF THE RATE ADJUSTMENT, THE SHIFT DUE TO TEMP VARIES FROM 1.0 PSI TO 7.7 PSI FROM STATIONS 1 THRU 7.

11-8-62

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1.0 GENERAL INFORMATION

1.1 SCOPE

1.1.1 This specification covers the method of calibrating and testing the JFC-47 Exhaust Nozzle Control.

1.2 EQUIPMENT REQUIRED

1.2.1 A pressure regulating valve, 580888 or equivalent, capable of maintaining regulated pressure at:

1. 1000 ± 70 psi above drain pressure over a flow range of 450-1500 pph.
2. 1000 ± 10 psi above drain pressure while the ENC is operated steady-state at its mid-position.
3. 1000 ± 50 psi above drain pressure while the ENC is being frequency response tested.

1.2.2 A 12,000 pph capacity flow bench consisting of a boost pump, an interstage pump and a main pump. The discharge pressure from the boost pump and the interstage pump shall be 40 ± 5 psi and 150 ± 15 psi, respectively. The main pump shall be capable of maintaining:

1. A supply pressure of 2900 ± 100 psi above interstage pressure during steady state ENC operation.
2. A mean supply pressure of 2800 ± 200 psi above interstage pressure during ENC frequency response testing.
3. A maximum peak to peak pressure variation of 1000 psi during ENC frequence response testing.

NOTE: Two properly functioning Lucas Rotox 1A389AMSSV5 pumps in parallel with a one quart accumulator charged to 1500 psig will meet this requirement.

1.2.3 A friction loading device to simulate the force required to move the engine exhaust nozzle. The fixture must meet the requirement of ETG 2798; namely it must have a loading actuator capable of applying a 40-15,000 lb. friction load on a 230 lb. plate which in turn is connected to a 3000 psi hydraulic actuator. The area of the hydraulic actuator is to be approximately 7.44 square inches on the closing side and 6.02 square inches on the opening side, and the stroke is to be 9.0 inches. The feedback arm from the actuator to the ENC is to be 8.32 inches long when the actuator is at mid-position. A 10% deviation in area is permissible provided that a corresponding change is made in the length of the feedback arm and in the total stroke in order to maintain the correct angular feedback change for a given actuator volume change.

1.2.4 Two pressure relief valves to limit inlet pressure (Phl) to 3400 psi and body pressure (pho) to 320 psi.

1.2.5 Pressure gages with the following ranges and accuracies:

1. Three gages 0-4000 psi with ± 1.0% accuracy.
2. Two gages 0-1500 psi with ± 0.25% accuracy.
3. Three gages 0-400 psi with ± 0.25% accuracy.
4. One gage 0-1000 psi with ± 0.25% accuracy.
5. One gage 0-100 psi with ± 0.5% accuracy.
6. One gage 0-50 psi with ± 0.5% accuracy.

1.2.6 One flow meter with a 20-500 pph range and an accuracy of 1.0%. Two flow meters with a 50-2000 pph range and an accuracy of 1.0%.

1.2.7 Orifices with the following flows and accuracies at 500 psi differential pressure or equivalent:

1. Two orifices, O_1 and O_2, capable of flowing 540 ± 15 pph.
2. One orifice, O_3, capable of flowing 620 ± 3 pph.
3. One .040 orifice, O_5.

1.2.8 Two filters, 3000 psi Purolator type 412-5 or equivalent, with 10 micron elements.

1.2.9 A protractor fixture, 569455-T-21 to mount on the control feedback shaft, 557114. The protractor must have a ±30 degree range with markings in at least one degree increments with an accuracy of ±0.25 degree. The fixture must be capable of referencing mid-area as determined by the indexing hole in the control shaft cover, 573334.

1.2.10 A fixture to apply a 11.6 lb.load for calibration of the half-area plunger. Ref. HS 1572 - Shimming Fixture 571575-T-2.

1.2.11 A fixture, 544900-ET-64 or equivalent, to set the proximity damper adjustment, 576782.

1.2.12 A 12 ft. stainless steel transmission line with a 0.18 inch inside diameter.

1.2.13 Stainless steel lines from the ENC to the two sides of the actuator. The fluid volume must be 33.9 in.3 on the closing side and 29.6 in.3 on the opening side.

1.2.14 A cycling valve at the end of the transmission line capable of sinusoidally varying its effective area versus time at a rate of 1-5 cps. The valve must be capable of meeting the requirements outlined in Appendix A.

1.2.15 A four channel Sanborn recorder or equivalent capable of recording actuator position, transducer position, control inlet pressure and regulated pressure

1.2.16 A pressure Drop Controller Assembly, 580710 or equivalent, to maintain a 50 psig drop in the drain pressure line.

1.3 Symbols

1.3.1 The following symbols are used in this specifications

	Phl	- Control Inlet Pressure	(psig)
	Pr	- Regulated Pressure	(psig)
	Phm1	- Metered Pressure	(psig)
	Phm2	- Metered Pressure	(psig)
	Phs	- Servo Pressure	(psig)
	Ptx	- Transmission Line Pressure	(psig)
	Pho	- Drain Pressure	(psig)
	Pho	- Cavity Drain Pressure	(psig)
	Phn	- Interstage Pressure	(psig)
Δ	Ptxo	- Differential Pressure (Ptx-Pho)	(psi)
Δ	Phs	- Half area piston differential Pressure (Pr-Pt2)	(psi)
	Wftx	- Transmission Line Flow	(pph)
	Wfho	- Drain Line Flow	(pph)
	Wfhn	- Interstage Flow	(pph)
	OBD	- Overboard Drain Leakage	(drops/min.)
	FSA	- Feedback Shaft Angle	(degrees)
	FL	- Friction Load on Actuator	(lbs.)
	PDC	- Pressure Drop Controller	

1.4 Test Requirements

1.4.1 Drain pressure and interstage pressure shall be maintained at 40 ±5 psi and 150 ±15 psi, respectively unless otherwise specified.

1.4.2 The drain pressure relief valve, RV1, and the inlet pressure relief valve, RV2, shall be set to relieve at 320 psig and 3400 psig, respectively.

1.4.3 The test fluid shall be in accordance with PWC 9073 and maintained at 95 ±5°F for purposes of this test.

1.4.4 The control component shall have been shimmed in accordance with HS 1572.

1.5 Inspection Requirements

1.5.1 The items marked with an asterisk (*) in this specification are HSD inspection items and as such must be under inspection surveillance by HSD. The steady-state acceptance test and the dynamic response acceptance test, paragraphs 4.0 and 5.0, respectively shall be subject to FAA source inspection.

2.0 HALF-AREA PISTON CALIBRATION

2.1 Installation

2.1.1 Obtain a 571576 half-area piston housing that has been assembled per paragraph 4.2 of HS 1572 and plumb per figure 1.

2.2 Calibration Procedure

2.2.1 Supply 1040 psig to inlet of test fixture. Adjust valve V_{20} to make Pho equal to 40 psig. Record transmission line pressure (Ptx). If Ptx is not equal to 540 ±3 psig, then enter figure 2 at recorded Ptx and determine amount of shims that must be added or subtracted. Make the appropriate shimming change as outlined in paragraph 4.2.5 of HS 1572A.

*2.2.2 Repeat step 2.2.1 until the following conditions are met:

Pr = 1040 psig
Pho = 40 psig
Ptx = 540 ± 3 psig

*2.2.3 The half-area piston stop is shimmed as follows:

1. Set the conditions of paragraph 2.2.2.
2. Slowly turn screw clockwise on cover fixture 571575-T-9 until the fuel flow just begins to change.
3. Remove cover fixture and obtain distance "A" from cover mounting surface to bottom of the adjusting screw.
4. Shim cover 575983 with 571577 shims until distance from the cover mounting surface to the 575982 stop is "A"+ (.028" to .030").

2.2.4 Return the half-area piston housing to the assembly floor for completion of assembly per HS 1572.

3.0 EXHAUST CONTROL CALIBRATION

3.1 Installation

3.1.1 Install the control feedback shaft protractor. Set the pointer on the shaft and rotate until the indexing hole in the pointer is over the indexing hole in the shaft cover. Insert the indexing pin. Adjust the protractor until the pointer is in the line with 0°. Then secure the protractor in place.

3.1.2 Mount the control on fixture 571575-T-1 and plumb control as per Figure 3. Remove the indexing pin.

3.2 Proof Pressure

3.2.1 With the use of an air hose, remove all traces of fluid from the external surface of the control.

3.2.2 Close valves V2 and V4 and open valve V5.

3.2.3 Adjust V1 and maintain the following conditions for a period of five minutes.

Phl = 3050 psig. min.
Pr = 3050 psig. min.
Pho = 300 ± 10 psig
FSA = 0°

There must be no external leakage and a maximum of 10 drops per minute to overboard drain (Ref. Paragraph 5.4.3). If the control exhibits leakage it is recommended that paragraph 3.3 be completed and that the control be checked for hysteresis prior to disassembly. The hysteresis must not exceed 2.0 degrees, in feedback shaft angle.

3.3 Calibration Procedure

3.3.1 Open valves V1, V2 and V4 and close valve 5.

3.3.2 Set Phl at 3050 psig, Pho at 40 psig, Pr at 1040 psig, and Phc at 90 psig using valve V1. Maintain Wftx at 620 pph while the feedback shaft is adjusted until Phml = Phm2. Ptx must be 540 ± 3 psig. If Ptx is not within the pressure limits, remove cover 571561 and adjust screw 579283-1.

Caution: Locking screw, 579283, must be loose when turning or attempting to turn the adjusting screw 579283-1.

3.3.3 Adjustment:

Increase Ptx: CCW
Decrease Ptx: CW

One turn of the adjusting screw will change Ptx approximately 30 psi.

3.3.4 Maintain the conditions of paragraph 3.3.2 and adjust locknut 69512-4 until Phml = Phm2 at a feedback shaft angle of 0°.

3.3.5 Adjustment:

To change FSA clockwise: CW
To change FSA counterclockwise: CCW

One turn of the locknut will change the FSA approximately 6°.

*3.3.6 Repeat paragraphs 3.3.2 and 3.3.4 until the following conditions are met without readjustment.

Phl = 3050 ±100 psig
Pr = 1040 psig
Pho = 40 psig
Phml = Phm2
FSA = 0°
Ptx = 540 ±3 psig
Phc = 90 ±5 psig
Wftx = 620 pph

If the above conditions cannot be met, it will be necessary to recheck the shimming operation as outlined in paragraph 4.5 of HS 1572.

3.3.7 The installation torque of the 69512-4 locknut along the threads of 576826 and of the 579283-1 adjusting screw through the helicoil mid-grip in lever 573183 must be 2.0-13.0 in.lbs. when the final adjustments have been completed. Torque lock screw 579283-2 to 8-12 in. lb. greater than the torque recorded at assembly an lockwire with MS20995C20.

4.0 STEADY-STATE ACCEPTANCE TEST

4.1 Installation

4.4.1 Remove plug AN814-10CL and install test fitting 571575-T-14. Plumb servo cavity to a 1500 psi gage.

*4.2 Pilot Valve Saturation Check

4.2.1 Set the following conditions:

Phl = 3050 ±100 psig
Phn = 150 ±15 psig
Pho = 40 ±5 psig
Pr = 1040 ±10 psig
Phc = 90 ±5 psig
Wftx = 620 pph

4.2.2 Vary transmission line flow and feedback shaft angle in the following sequence: max. flow, nominal flow, and minimum flow and -30°, 0° +30° respectively. The limits specified in Appendix B must be met.

4.2.3 Remove the test fitting and re-install the AN814-10CL plug

*4.3 Transmission Line Schedule

4.3.1 Open valves V1, V2, and V4 and set the following conditions:

Phl = 3050 ±100 psig
Pho = 40 ±5 psig
Pr = 1040 psig
Phc = 90 ±5 psig

4.3.2 Vary transmission line valve, V2, and FSA in accordance with Appendix C to establish null point (Phm1 = Phm2) at each specified valve configuration. The FSA values must fall within the limits specified in Appendix C.

5.0 DYNAMIC RESPONSE ACCEPTANCE TEST

5.1 Installation

5.1.1 Mount the control on the friction loading fixture, ETG 2798, install regulator, and plumb the control as outlined in Figure 4, except main pilot valve drain may be routed to atmosphere if desired. [illegible] drains

5.1.2 Remove the AN 814-8 CL plug from the damper housing, back off on the 69512-4 locknut, and install the damper adjusting fixture 544900 Et-64. Close valve V7 and open valve V6.

5.2 Damper Setting

5.2.1 Set the following conditions:

Phc = 90 ±5 psig
phl = 3050 ±100 psig
Pho = 40 ±5 psig
Phn = 150 ±15 psig
Pr = 1040 ±10 psig
Ptx = 540 ±10 psig
FL = 0 lbs.

5.2.2 Engage the damper adjusting fixture and slowly turn clockwise until the 230# plate begins to drift towards increase area.

5.2.3 Turn the damper adjustment .0045" counterclockwise.

5.2.4 Rapidly change Ptx several times from 540 psig to minimum pressure in order to parallel the damper plates.

5.2.5 Repeat paragraphs 5.2.2, 5.2.3, and 5.2.4.

*5.2.6 Hold the adjusting screw securely with the adjusting fixture and apply a torque of 30-35 in. lbs. on the 69512-4 locknut.

NOTE: Prior to locking the 69512-4 locknut, the nut and the adjusting screw must have an installation torque (torque required to move the nut along the 576782 screw and also the 576782 screw through the helicoil mid-grip in the 576819 housing) of 2.0-15.0 in. lbs.

5.3 Frequency Response Check

5.3.1 Set the conditions of paragraph 5.2.1 and close all pressure gages.

*5.3.2 Apply sinusoidal motions to the transducer valve at frequencies of 1,2, and 4 cps. The amplitude of the input signal must be adjusted such that the amplitude of the actuator is 1.0 ±0.1 inch peak to peak. Record the following on a four-channel Sanborn:

Frequency CPS	Paper Speed MM/SEC	Actuator Amplitude inch	Transducer Position inch	Phl psig	Pr psig
1	25	1.0±0.1	Record	Record	Record
2	50	1.0±0.1	Record	Record	Record
4	100	1.0±0.1	Record	Record	Record

*5.3.3 With the frequency response checked in accordance with section 5.3.2, the actuator position must not lag the transducer position by any more than the following values:

Frequency CPS	Max Phase Lag Degrees
1	40
2	55
4	90

*5.3.4 Adjustment:

1. Re-adjust the damper .0009" CCW if the phase lag is greater than the maximum allowable value and repeat paragraphs 5.3.1, 5,3,2, and 5.3.3.

2. Re-adjust the damper .0005"CW if there are any signs of 120 cps instability or 30 cps shutter on the Sanborn traces and repeat paragraphs 5.3.1, 5.3.2, and 5.3.3.

5.3.5 Remove the adjusting fixture and install the AN 814-8CL plug.

*5.4 External and Overboard Drain Leakage

5.4.1 With the use of an air hose, remove all traces of fuel from the external surface of the control.

5.4.2 Close valves V2 and V4 and set Valve V1 to obtain the following conditions for a period of five minutes.

Phl = 3050 psig min.
Pr = 1040 psig min.
Ptx = 1000 psig min.
Phc = 165 ±10 psig

5.4.3 There must be no external leakage and a maximum of 10 drops per minute to overboard drain. The term "no leakage" shall be defined as the permissible visual appearance of fluid on the external surface of the control which does not become progressively greater during the prescribed period of time of this test (5 minutes) to such a degree that fluid runs off the surface of the control or forms droplets.

5.4.4 With valve V6 in its normally open position, open valve V7 and pressurize the exhaust nozzle control for normal operation. Slowly close valve V6 until Phd is 10 psig. Maintain conditions for a period of five minutes. Record any leakage by the feedback shaft.

6.0 PREPARATION FOR STORAGE AND SHIPMENT

6.1 Upon completion of test the control shall be lockwired and prepared for storage and shipment in accordance with HS1572 paragraphs 4.10.2, 5.0, and 6.0.

APPENDIX A

CYCLING VALVE REQUIREMENTS

1. The valve linearity shall be obtained as follows:

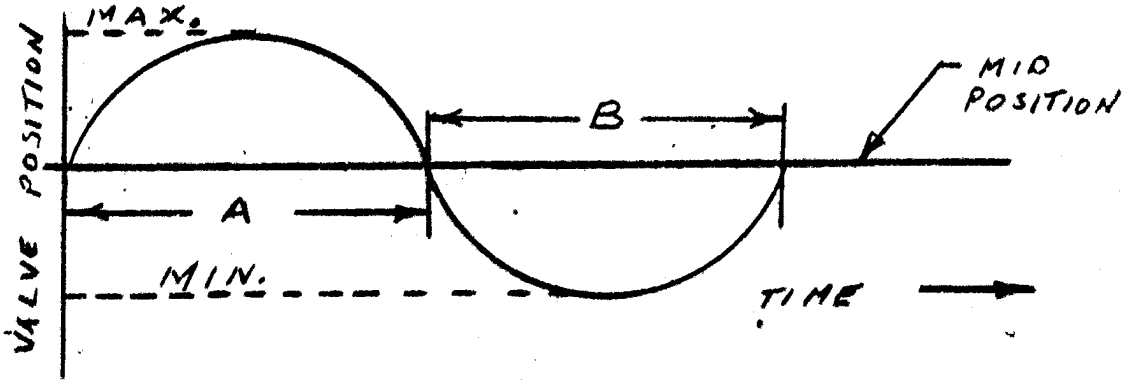
   a. Maintain a 500 ± 5 psi differential pressure across the cycling valve.

   b. Displace the valve in 25 pph increments between 525 pph and 725 pph and record valve displacement at each flow setting.

   The valve shall be linear within ±3% of the total stroke required to change fuel flow from 525 pph to 725 pph.

2. The harmonic content (wave destortion) shall be determined by cycling the valve at 4.0 ± 0.2 cps. The resolved valve position versus time trace must meet the following requirements:

   a. Symmetry.



   a.1 Determine the mid-position from

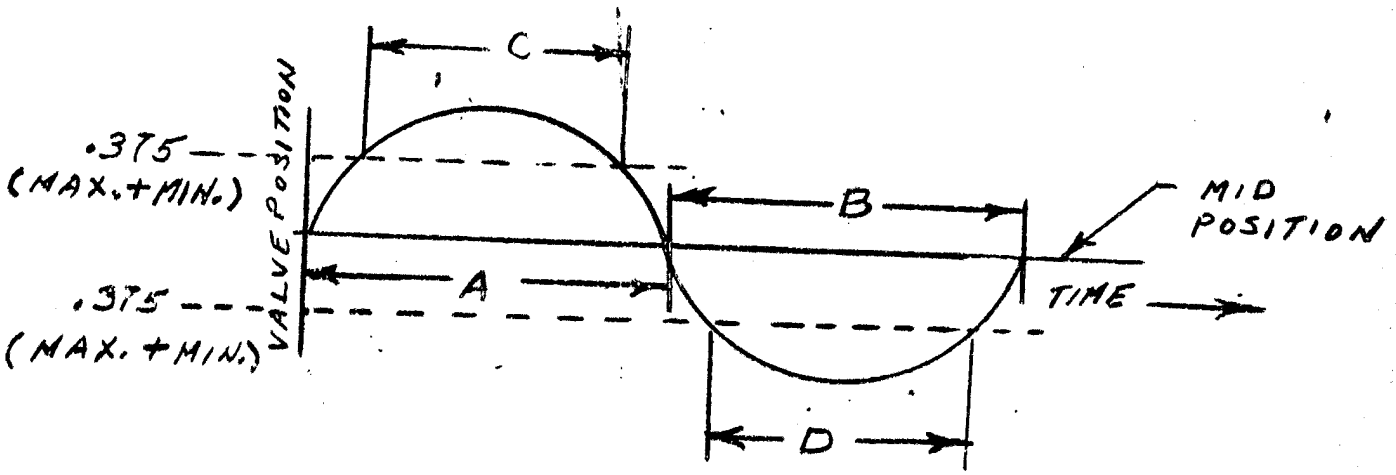
$$\left[\frac{\text{MAXIMUM} + \text{MINIMUM}}{2}\right]$$

   a.2 Then determine time "A" and time "B".

   a.3 The factor A/B must be between 0.85 and 1.18.

2. (continued)

b. Wave Shape



b.1 Draw lines at ± 0.375 (MAX + MIN) from mid-position.

b.2 Measure the times C and D as shown.

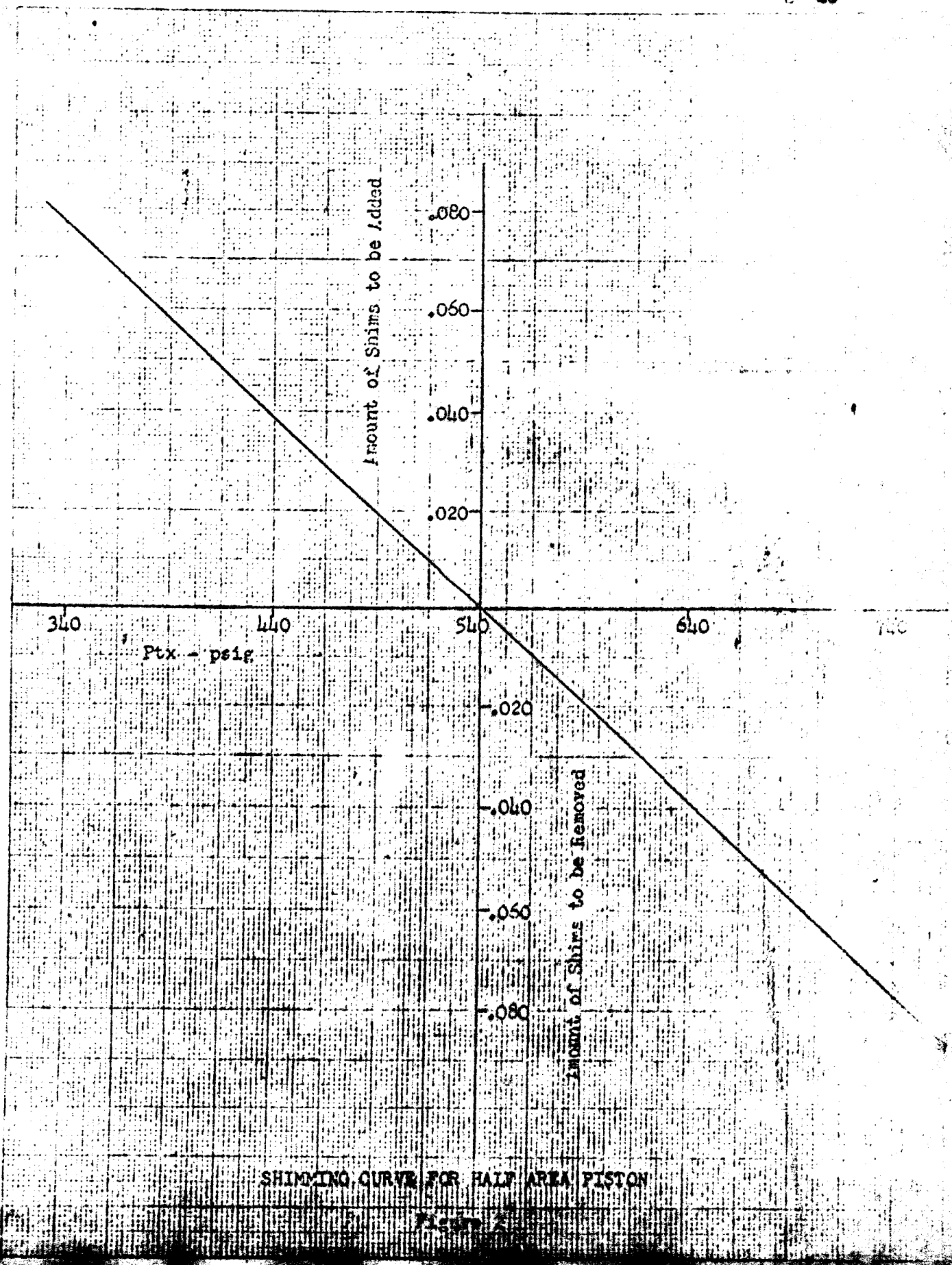
b.3 The factors $\frac{C}{A+B}$ and $\frac{D}{A+B}$ must be between 0.19 and 0.27.

APPENDIX B

	Wftx pph	Ptx psi	FSA deg.	Phs psi	Wfho pph	Wfhn pph
1.	max flow	200 max Record	-30	380 max Record	Record	Record
2.	620±3	540±10 Record	0	Record	100-150	800 pph max Record
3.	0	1000 min Record	+30	800 min Record	Record	Record

APPENDIX C

	Wftx pph	Direction of Approaching FSA	FSA Degrees	Ptx psi
1.	620±3	Inc.	0±1	Record
2.	362±2	Inc.	17 to 27 degrees greater than #I	"
3.	620±3	Dec.	0 to 2 degrees greater than #I	"
4.	905±5	Dec.	17 to 27 degrees less than #3	"
5.	1120±15	Dec.	-30 to -50 degrees or Phm1 >Phm2 at min. angle	"
6.	125±5	Inc.	+30 min or Phm2 Phm1 at max angle	"



SHIMMING CURVE FOR HALF AREA PISTON

Figure 2

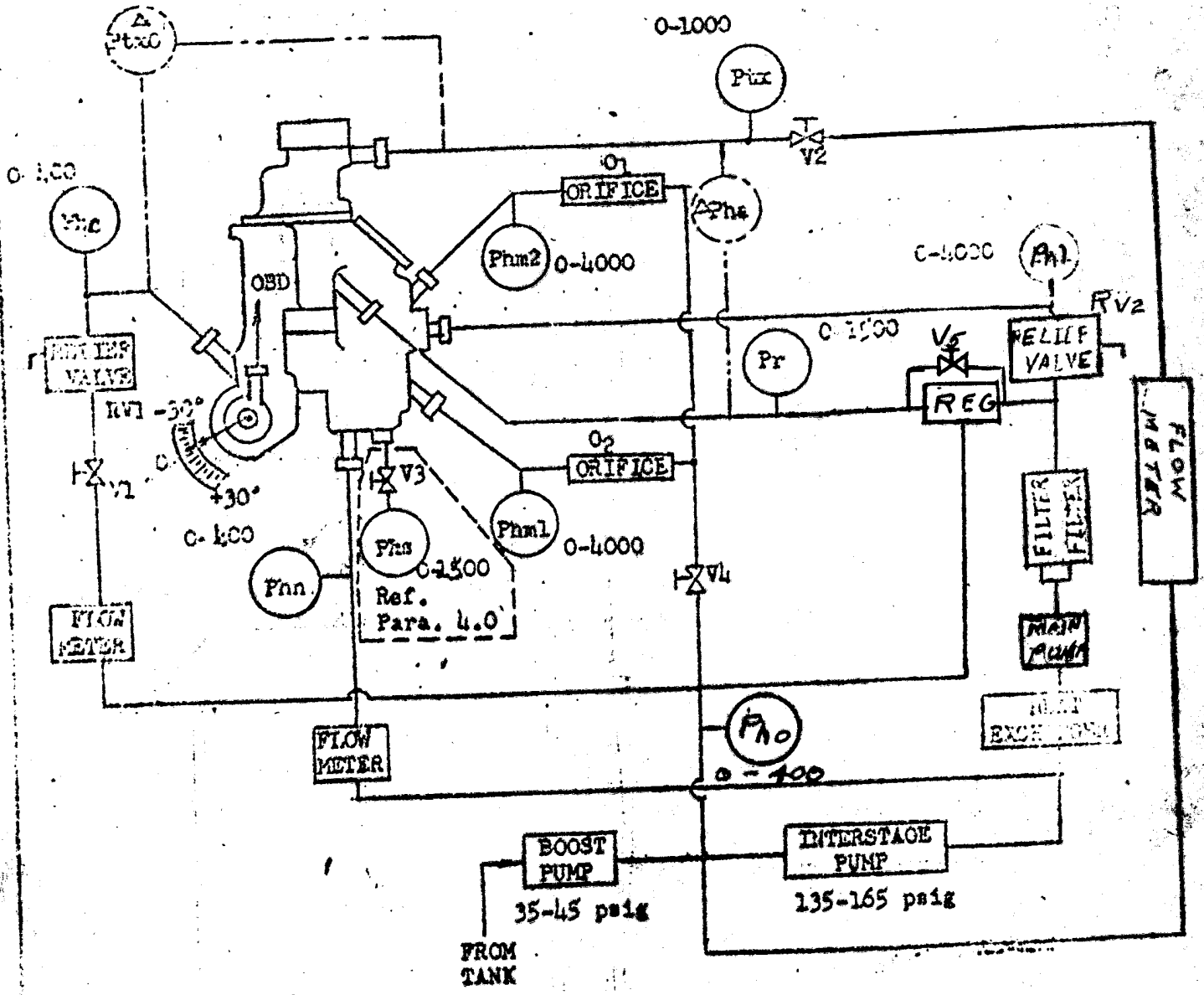


Figure 3.

STEADY- STATE PLUMBING SCHEMATIC

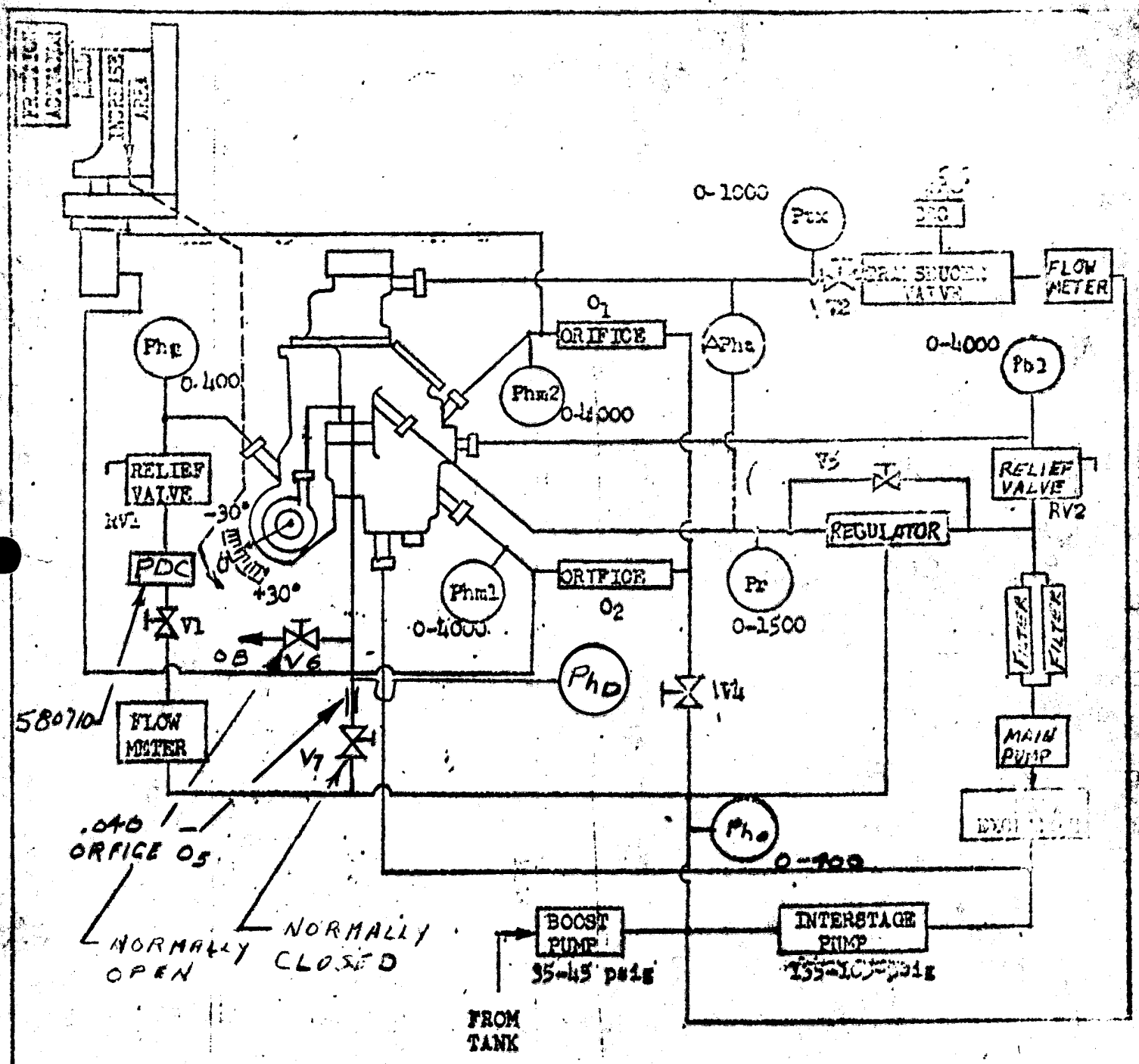


Figure 4.

DYNAMIC RESPONSE PLUMBING SCHEMATIC

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H.S. 1508D, EXHAUST NOZZLE CONTROL - JFC47, CALIBRATION AND ACCEPTANCE OF"

Amendment /

1. Change paragraph 5.3.2 from:

*5.3.2 Apply sinusoidal motions to the transducer valve at frequencies of 1, 2, and 4 cps. The amplitude of the input signal must be adjusted such that the amplitude of the actuator is 1.0 ±0.1 inch peak to peak. Record the following on a four-channel Sanborn:

Frequency CPS	Paper Speed MM/SEC	Actuator Amplitude inch	Transducer Position inch	Phl psig	Pr psig
1	25	1.0 ± 0.1	Record	Record	Record
2	50	1.0 ± 0.1	Record	Record	Record
4	100	1.0 ± 0.1	Record	Record	Record

to read:

*5.3.2 Apply sinusoidal motions to the transducer valve at frequencies of 1, 2, and 4 cps. The amplitude of the input signal must be adjusted such that the amplitude of the actuator is 1.0 ±0.1 inch peak to peak. Record the following on a four-channel Sanborn:

Frequency CPS	Paper Speed MM/SEC	Actuator Amplitude inch	Transducer * Position inch	Phl * psig	Prs psig
1	25	1.0 ± 0.0	Record	Record	Record
2	50	1.0 ± 0.1	Record	Record	Record
4	100	1.0 ± 0.1	Record	Record	Record

* These items must be recorded on the Sanborn trace. However it is not necessary that they be recorded on the log sheets.

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Date: 10-15-62

H.S. 1508D "EXHAUST NOZZLE CONT. - JFC47 CALIBRATION ACCEPTANCE OF.

Amendment 2

1. Change paragraph 5.1.1 from:

5.1.1 Mount the control on the friction loading fixture, ETG2798, install regulator, and plumb the control as outlined in Figure 4, except, all drains except main pilot valve drain maybe routed to atmosphere if desired.

to read:

5.1.1 Mount the control on the friction loading fixture, ETG2798, install regulator, and plumb the control as outlined in Figure 4 except, all drains except main pilot valve drain must be routed to atmosphere.

1.0 SCOPE

1.1 This specification covers the acceptance and testing of the fuel adjustment remote trimmer for the JFC47 fuel control.

2.0 Applicable Drawings

2.1 The configuration and dimensions of the remote trimmers shall be as shown on the applicable Hamilton Standard drawing.

3.0 REQUIREMENTS

3.1 Equipment Requirement

3.1.1 Test Bench

Acceptance testing of this remote trimmer requires a test bench with the following equipment and/or capabilities.

3.1.1.1 Fuel Supply

A fuel source capable of supplying 300 PPH at a pressure of 150-500 psig. The fuel temperature is to be maintained at 85 ± 20°F unless otherwise specified.

3.1.1.2 Flow Meter

A flow meter with a 0 - 300 PPH range and an accuracy of 2% of point.

3.1.1.3 Gages

(a) One inlet pressure gage with a range of 0 - 500 psig, and an accuracy of ±2% full scale.

(b) One 0 - 300 psi differential gage with 2% accuracy.

3.1.1.4 Pressure Relief Valve

A relief valve capable of limiting pump outlet pressure to 500 psig.

3.1.1.5 Power Supply

A power supply of 208 ± 5% VAC, 400 ± 80 CPS, 3 phase shall be available.

3.1.1.6 Test Fixtures

(a) A remote trimmer mounting block, similar to ETG 2465
(b) Test fixture metallic seals or equivalent as follows:
One (1) 69400-A21
One (1) 69400-A36
One (1) 69397-A19

3.1.2 High Temperature Test Bench

A test bench similar to that required in Paragraph 3.1.1 but capable of operating at 450°F with PWA523B fuel.

3.2 General Test Requirement

3.2.1 Test Fluid

The test fluid shall be in accordance with PWA523B and maintained at 85 ± 20° unless otherwise specified.

3.2.2. Power Supply

The 208 VAC power supply shall be capable of being directed to either of two pins of the remote trimmer electrical connector by means of a 3 position switch.

3.2.3 Abbreviations, Units, and Setting Accuracies

The following is a list of abbreviations (symbols) used in defining remote trimmer performance parameters. All readings, or settings, are to be held to the accuracies listed, unless otherwise specified:

Parameter	Symbol	Units	Set Within	Full Scale Measurement Accuracy
Inlet Pressure	Pin	psig	±5	±2%
Pressure Differential (Pin-PD)	Δ P	psi	---	±2%
Fuel Flow	Wf	PPH	---	±2%
Drain Pressure	PD	psig	±2	±2%

3.2.4 Plumbing

The test plumbing requirements are defined on Figure 1, Appendix A.

4.0 High Temperature Acceptance Test

4.1 Installation

4.1.1 Mount the remote trimmer on test fixture and plumb in accordance with Figure 1, Appendix A.

4.2 Torque

4.2.1 Set Pin = 200 psig, PD = 50 psig, and fuel temperature at 440 ± 10°F. With 208 VAC 400CPS power supplied to the remote trimmer, apply restraining torque to trimmer output shaft until shaft ceases to turn. Check the stall torque in each direction of rotation and record.

NOTE: Duty cycle of the unit at elevated temperature is 5 minutes on, 5 minutes off. During any phase of the High Temperature Acceptance Test, the power shall never be applied for periods longer than 5 minutes. After any 5 minute period of applied power the unit shall be allowed to cool for no less than 5 minutes.

4.3 Range and Rate of Adjustment

4.3.1 Apply power to the trimmer and determine the number of revolutions for full range of the trimmer and the rate of operation.

4.3.2 The full range of trimmer operation shall be 5 ± $\frac{1}{4}$ turns. Record range.

4.3.3 The rate of operation of the trimmer shall be 1 ± $\frac{1}{4}$ RPM with 400 CPS power supplied. Record rate.

4.3.4 When the range and rate of adjustment have been determined, position the output shaft in the full CCW position when viewed in direction "E" as shown on applicable drawings. Run unit against the full CCW position stop for 10 seconds, set 3 position power switch to DFF, and return unit to room temperature conditions.

5.0 ROOM TEMPERATURE ACCEPTANCE TEST

5.1 INSTALLATION

Mount the remote trimmer on test fixture ETG 2465 or equivalent, and plumb in accordance with Figure 1, Appendix A.

5.2 Leakage Test

5.2.1 Set and maintain the following conditions for five (5) minutes:

Pin = PD = 385 ± 15 psig

5.2.1.1 There shall be no visible external leakage or weepage, except through the overboard drain fitting. Note location if leakage or weepage occurs.

5.2.1.2 Overboard drain leakage shall not exceed 1 cc/min. Record actual leakage.

5.3 Cooling Flow

5.3.1 Set Pin = 200 psig, PD = 50 psig (ref, ΔP = 150 psi) and measure flow. Cooling flow shall not exceed 100 PPH. Record actual flow.

5.4 Torque

5.4.1 Remove remote trimmer from fixture ETG 2465.

5.4.2 Install fixture 20 X 18001 and supply boost pressure to trimmer.

5.4.3 With 208 VAC 400 CPS power applied, apply restraining torque to trimmer output shaft until output shaft ceases to turn. Check each direction of rotation.

Note: Duty cycle of the unit is 10 minutes on, 10 minutes off. During any phase of this acceptance test, the power shall never be applied for periods longer than 10 minutes. After any 10 minute period of applied power the unit shall be allowed to cool for no less than 10 minutes.

5.4.3.1 The restraining torque (stall torque) shall be 15-23 inch-pounds. Record stall torque in each direction.

5.4.4 If external adjustments are provided, they must be capable of adjustment with 5-45 in# of torque. Record torque required to make external adjustment.

5.5 Range and Rate of Adjustment

5.5.1 Apply power to trimmer and determine the number of revolutions for full range of trimmer, and the rate of operation.

5.5.1.1 The full range of trimmer operation shall be 5 ± 1/4 turns. Record range.

5.5.1.2 The rate of operation of the trimmer shall be 1 ± $\frac{1}{4}$ RPM at 400 CPS power supply. Record rate.

5.5.2 In preparation for shipment, position the output shaft in the full CCW position when viewed in direction "E" as shown on applicable drawings.

6.0 QUALITY ASSURANCE PROVISIONS

6.1 It shall be the responsibility of the remote trimmer manufacturer to conduct an acceptance test of each remote trimmer prior to shipment. As a minimum, this acceptance test must demonstrate conformance with the functional requirements defined in paragraphs 4.0 and 5.0 of this specification.

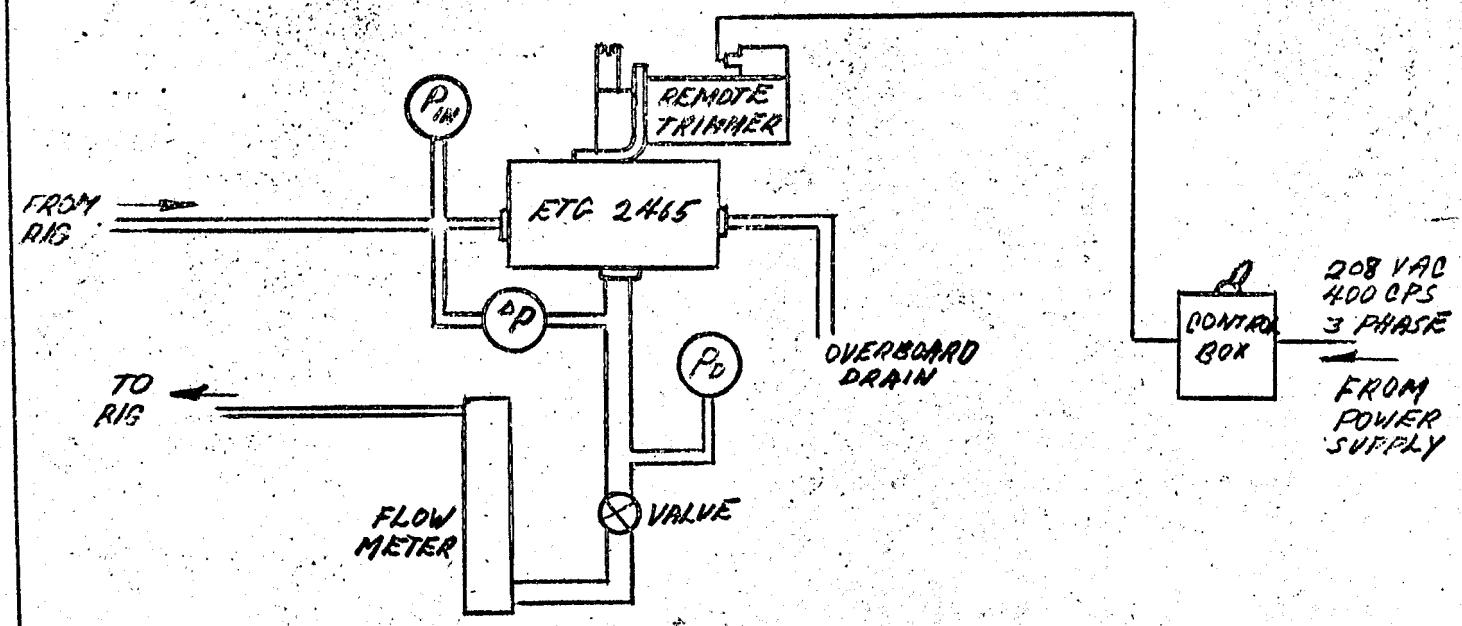
6.2 It shall be the responsibility of the Hamilton Standard Quality Control Department to insure functional compliance of the unit to the requirements specified in paragraphs 4.0 and 5.0 of this specification, and to insure compliance with (MIL-Q-9858).

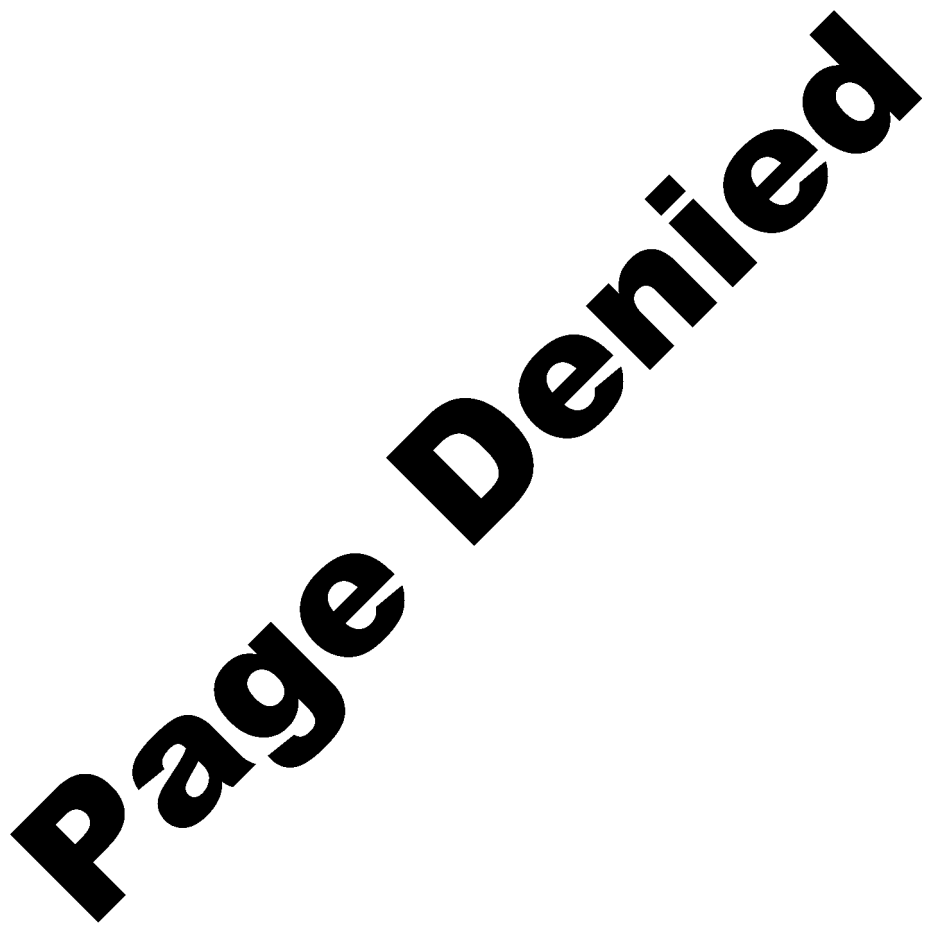
7.0 PREPARATION FOR DELIVERY OR STORAGE

7.1 Upon completion of the acceptance test procedure, the remote trimmer shall be drained of all residual fuel and flushed with MIL-E-6081, Grade 1010 oil and equivalent. All openings shall be capped to exclude dirt and other foreign matter, and to protect threaded fittings.

APPENDIX A

JFC-47 REMOTE TRIMMER PLUMBING SCHEMATIC





1. General Requirements

1.1 Equipment Requirements

1.1.1 Flowbench capable of handling at least 0-4000 PPH flow of PWA 523B at 3000 psig pressure and 90 ± 10°F.

1.1.2 Flow Meter - Range of 300 to 1400 PPH and capable of 200 psi working pressure.

1.1.3 Flow Meter - Range of 0 to 50 PPH and capable of 200 psi working pressure.

1.1.4 One hand valve to set pressure in the regulator discharge line upstream of the Flow meter (transmission pressure) as shown on figure 1.

1.1.5 Pressure Regulator for maintaining drain pressure at 30-155 psi.

1.1.6 Instrumentation for taking the measurements listed below with the accuracy specified:

P1 Regulator inlet pressure, at least 2000 to 4000 psig pressure range with an accuracy of ±25 psig within this range.

PR Regulated pressure, at least 500 to 1500 psig pressure range with an accuracy of ±10 psig within this range.

Wf Fuel flow out of regulator 300 to 1400 pph range with an accuracy of 2% within the range.

Wlf Leakage flow out of drain 0 to 50 pph range with an accuracy of 2% within this range.

PD Drain pressure, at least 30 to 350 psig pressure range with an accuracy of ±4 psig within this range.

T Regulator inlet fuel temperature, at least 70° to 110°F temperature range with an accuracy of ±5°F within this range.

1.2 Test Fluid

The calibration test fluid shall be PMC 9073 for static and dynamic tests and P & WA 523B for hot tests.

1.3 Installation

The regulator shall be mounted on the flow bench in a position similar to its mounting on the engine as shown on figure 1.

1.4 Data Required

1.4.1 The following data shall be recorded on each data sheet.

1.4.1 (continued)

A. Regulator Serial No.
B. HSD Parts List and Revision No.
C. Test Fluid Type and Specific Gravity
D. Test Fluid Temperature

1.4.2 The following data shall be recorded when specified:

Pl Regulator Inlet Pressure

PR Regulated Pressure

Wf Regulated Fuel Flow

Wlf Drain Leakage Flow

PD Drain Pressure

2. Shimming:

2.1 Assemble the regulator per applicable blueprint with .080 shims and plumb on the Rig according to figure 1. With Pl at 3050 psi set Wf by hand valve to read 800 ± 10 pph with PD at 30 psi, NOTE: PR. Determine the thickness of shims necessary to obtain PR = 1070 psi at Pl = 3050 psi, PD = 30 psi and Wf = 800 ± 10pph (3.5 psi/.001 shim)

2.2 After adding or subtracting the calculated amount of shims, run the control again and record regulated pressure. If Pr is not 1070 ± 20 psigreshim per paragraph 2.1.

3. Test Procedure

3.1 Calibration - Inspection Required

Under flow conditions and with Pl at 3050 ± 10 psi, PD at 30 ± 5 psi, T at 95° to ±5°F, set hand valve to obtain the Wf as tabulated by test points in the order listed. Record Pl, PD, Wf and PR for each test point.

Test Point	Pl PSIG	Wf PPH	PD PSIG	Limits PR-PSIG
1.	3050±20	400±10	30±5	950 - 1200
2.	3050±20	500±10	30±5	950 - 1200
3.	3050±20	600±10	30±5	950 - 1200
4.	3050±20	700±10	30±5	950 - 1200
5.	3050±20	800±10	30±5	1050 - 1090
6.	3050±20	900±10	30±5	950 - 1200
7.	3050±20	1000±10	30±5	950 - 1200
8.	3050±20	1100±10	30±5	950 - 1200
9.	3050±20	1200±10	30±5	950 - 1200
10.	3050±20	1000±10	30±5	Within 25 psig of PR recorded at test point 7.
11.	Within 20 psig of Pl recorded at test point 5	800±10	30±5	Within 25 psig of PR recorded at test point 5.
12.	3050±20	600±10	30±5	Within 25 psig of PR recorded at test point 3.
13.	3050±20	400±10	30±5	Within 25 psig of PR

3.1 (continued)

Limits: Regulated pressure must be within the specified limits at each test point.

3.2 DRAIN LEAKAGE

At the conditions specified in test point 9 of paragraph 3.1, record the drain leakage flow. Leakage flow shall not exceed 20 pph. 20 PPH = 188.5 cc/min or 6.37 oz/min.

3.3 EXTERNAL LEAKAGE

Completely close the regulated pressure hand valve. Adjust regulator inlet pressure (P1) to 3400 to 3500 psig and drain pressure (PD) to 300 ± 10 psig for a period of at least three (3) minutes. Record P1, PD, PR, and any external leakage.

Limits: There shall be no external leakage from any portion of the regulator assembly.

3.4 Frequency Response Test

Install the PRV into the test set-up as shown in Figure 2 Page 2.

The pressure transducer should be as close to the PRV as possible.

Adjust valve "C" to obtain 400 ± 25 pph fuel flow with P1 at 3000 ± 20 psig and cycle the cycling valve at 5 cps and at an amplitude such that P1 oscillates at an amplitude of 400 ± 20 psi peak to peak. Cycling range shall fall within the limits of 2580 - 3020 psig.

Record Wf pph and PR amplitude psi PR limit 20 psi peak to peak max.

Adjust Valve "C" to obtain 1200 ± 25 pph fuel flow with P1 at 3000 ± 20 psig and repeat the frequency response at 5 cps, P1 = 400 ± 20 psi peak to peak. The PRV amplitude limit is 20 psi peak to peak max.

3.5 HOT FUEL TEST

3.5.1 Install the PRV in accordance with Figure 1 on the hot test rig and repeat test points 1, 3, 5, 7, 9, 10, 11, 12 & 13 of Para. 3.1.

3.5.2 Carry out the following test at elevated temperatures:

Test Point	P1 (PSIG)	Wf (PPH)	Fuel Temp.
1	3050 ± 20	400 ± 10	450° ± 10°
2	3050 ± 20	600 ± 10	450° ± 10°
3	3050 ± 20	800 ± 10	450° ± 10°
4	3050 ± 20	1000 ± 10	450° ± 10°
5	3050 ± 20	1200 ± 10	450° ± 10°

3.5.2 (continued)

Limits: There shall be no instability when changing the Wf from the established test point value to the most extreme test point Wf and back to the established test point Wf in an elapsed time of 2 sec. or less (example: 400 pph to 1200 pph to 400 pph; 800 pph to 1200 pph to 800 pph; 1000 pph to 400 pph to 1000 pph, etc.)

3.5.3 After completing the hot test repeat para. 3.5.1.

3.6 Damping Land Leakage Test

Remove the AN814 -2SL plug from the base of the PRV and replace with a standard -2 union and set up as shown in Figure 3 Page 3

Carry out the following tests:

P psig	PR	PD psig	Leakage cc/min
3000	Record	2000 (Adjusted by needle Valve D)	Record

4.0 Preservation and Storage

After completion of testing, the regulator assembly shall be drained of fuel and prepared for storage in accordance with HS Spec. No. 380. Protective covers and containers shall be used to prevent damage or contamination of the regulator assembly.

5.0 Applicable Figures

Figure 1 Test Position and Schematic Diagram 4/18/61.

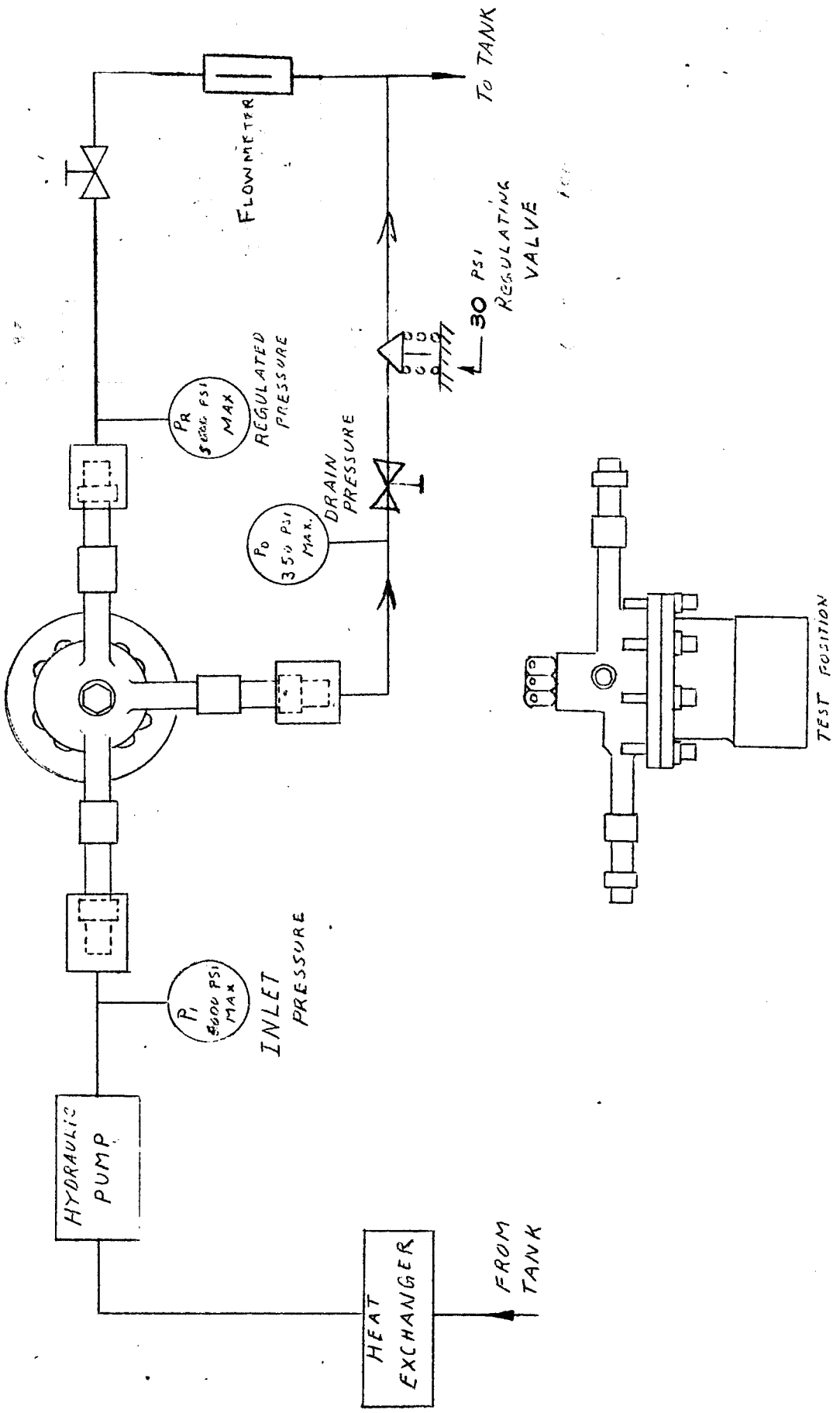


FIGURE 1 OF 1

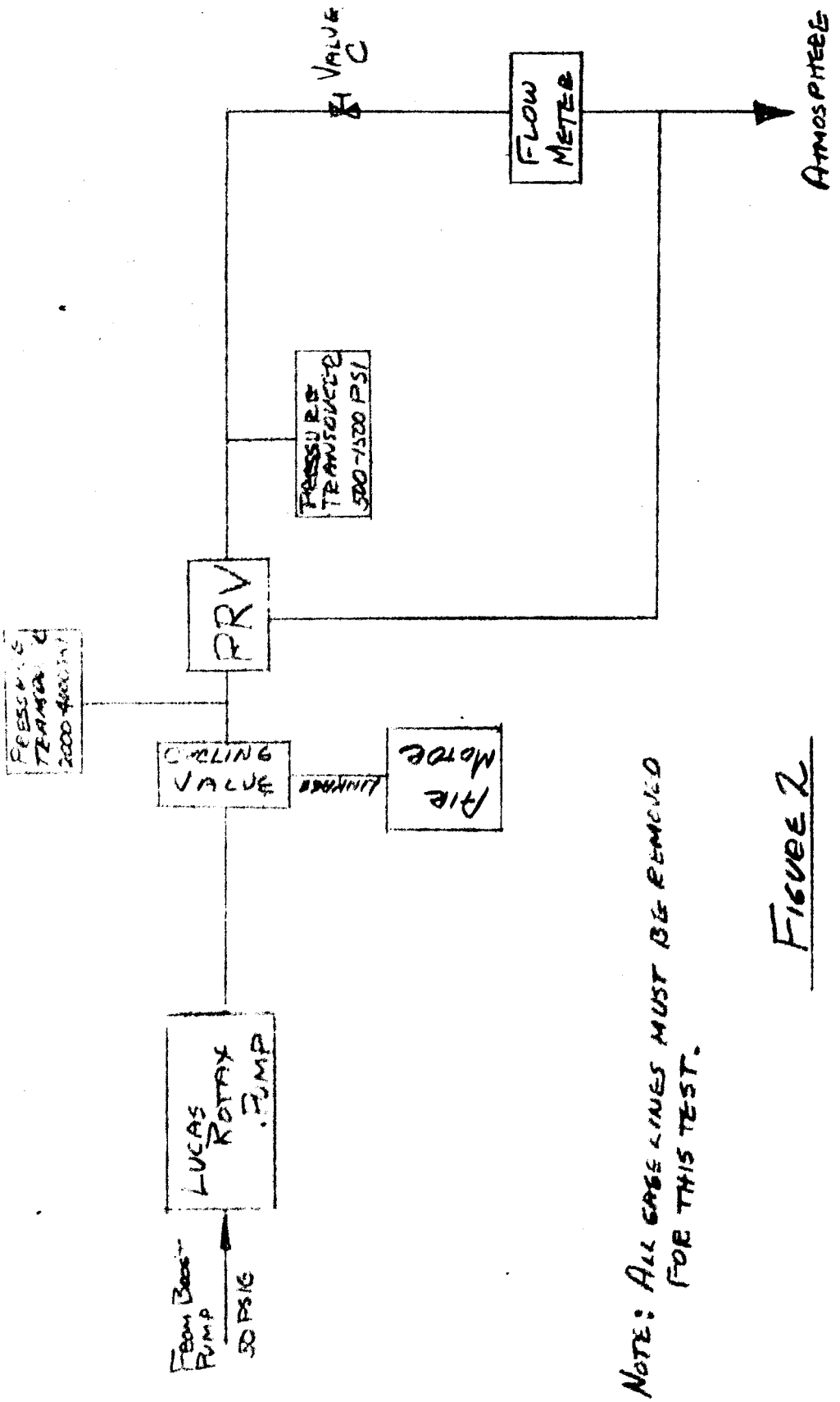


FIGURE 2

NOTE: ALL CASE LINES MUST BE REMOVED FOR THIS TEST.

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H.S. 1149C
Amend. 1
Page 2 of 3
E.O. 73708
Date: 11-16-62

H. S. 1149, "PRESSURE REGULATOR - ENC. JFC47, CALIBRATION OF"

Amendment 1

4. Change paragraph 3.6 from:

3.6 "Damping Land Leakage Test

Remove the AN814 -2SL plug from the base of the PRV and replace with a standard -2 union and set up as shown in Figure 3 Page 3

Carry out the following tests

P1 psig	PR	PD psig	Leakage cc/min
3000	Record	2000 (Adjusted by needle Valve D)	Record

to read:

3.6 "Post Hot Test Calibration Check

Repeat paragraph 3.1

5. Add the following as para. 3.7.

3.7 "Remove the AN814 -2SL plug from the base of the PRV and replace with a standard -2 union and set up as shown in Figure 3 Page _____.

Carry out the following tests

P1 psig	PR	PD psig	Leakage cc/min
3000	Record	2000 (Adjusted by needle Valve D)	Record

6. Add the attached sheet as Figure 3.

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H.S. 21903
Amend. /
Page 1 of 2
E.O. 13708
Date: 11-16-62

H. S. 21903. "PRESSURE REGULATOR - ENG. JF347, CALIBRATION OF"

Amendment /

1. Change the first sentence of paragraph 3.4 from:

3.4 "Install the PRV into the test set-up as shown in Figure 2 Page 2.

to read:

3.4 "Install the PRV into the test set-up as shown in figure 2 page 7.

2. Change paragraph 3.5.1 from:

3.5.1 "Install the PRV in accordance with Figure 1 on the hot test rig and repeat test points 1, 2, 5, 7, 9, 10, 11, 12 & 13 of Para. 3.1.

to read:

3.5.1 "Install the PRV in accordance with Figure 1 on the hot test rig and carry out the following test at elevated temperatures:

Test Point	P2 (PSIG)	Wf (PPH)	Fuel Temperature
1	3050 ± 25	400 ± 50	450° ± 25
2	3050 ± 25	600 ± 50	450° ± 25
3	3050 ± 25	800 ± 50	450° ± 25
4	3050 ± 25	1000 ± 50	450° ± 25
5	3050 ± 25	1200 ± 50	450° ± 25

Limits: There shall be no instability when changing the Wf from the established test point value to the most extreme test point Wf and back to the established Wf in an elapsed time of 2 sec. or less (example: 400 PPH to 12000 PPH to 400 PPH; 800 PPH to 1200 PPH to 800 PPH; 1000 PPH to 400 PPH to 1000 PPH; etc.)

3. Delete paragraph 3.5.2 and 3.5.3.

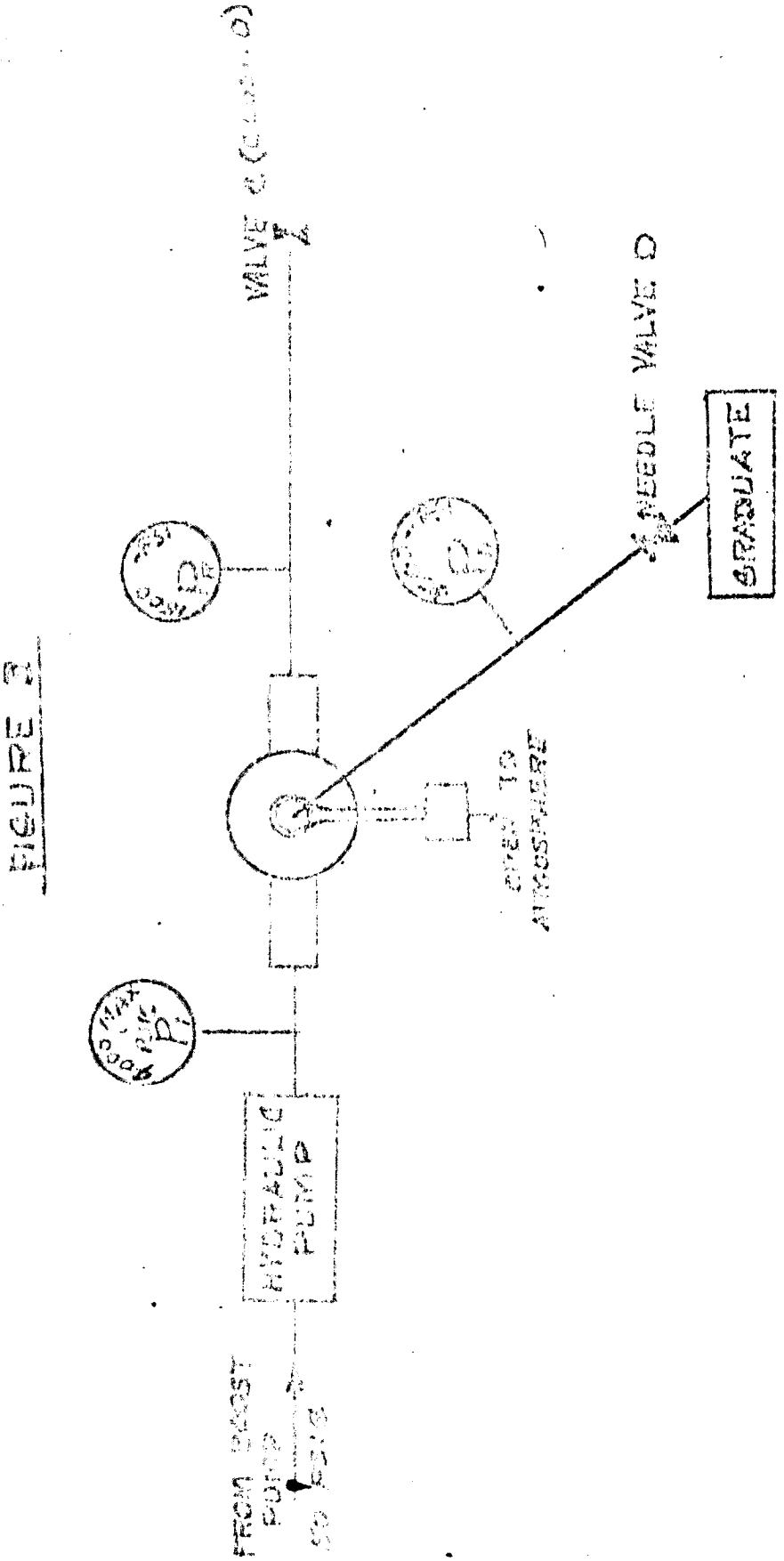

FIGURE 2

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H.S. 14940
Amend. 1
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E.C. 73708
Date: 11-16-62

H. S. 14940 "PRESSURE REGULATOR - ENG. JFC47, CALIBRATION OF"

Amendment 1

1. Change the first sentence of paragraph 3.4 from:

3.4 "Install the PRV into the test set-up as shown in Figure 2 Page 2.

to read:

3.4 "Install the PRV into the test set-up as shown in figure 2 page 7.

2. Change paragraph 3.5.1 from:

3.5.1 "Install the PRV in accordance with Figure 1 on the hot test rig and repeat test points 1, 3, 5, 7, 9, 10, 11, 12 & 13 of Para. 3.1.

to read:

3.5.1 "Install the PRV in accordance with Figure 1 on the hot test rig and carry out the following test at elevated temperatures:

Test Point	P1 (PSIG)	Wf (PPH)	Fuel Temperature
1	3050 ± 20	400 ± 50	450° ± 25
2	3050 ± 20	600 ± 50	450° ± 25
3	3050 ± 20	800 ± 50	450° ± 25
4	3050 ± 20	1000 ± 50	450° ± 25
5	3050 ± 20	1200 ± 50	450° ± 25

Limits: There shall be no instability when changing the Wf from the established test point value to the most extreme test point Wf and back to the established Wf in an elapsed time of 2 sec. or less (example: 400 PPH to 12000 PPH to 400 PPH; 800 PPH to 1200 PPH to 800 PPH; 1000 PPH to 400 PPH to 1000 PPH; etc.)

3. Delete paragraph 3.5.2 and 3.5.3.

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H.S. 1494C
Amend. 1
Page 2 of 3
E.C. 73708
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H. S. 1494 "PRESSURE REGULATOR - ENC, JFC47, CALIBRATION OF"

Amendment 1

4. Change paragraph 3.6 from:

3.6 "Damping Land Leakage Test

Remove the AN814 -2SL plug from the base of the PRV and replace with a standard -2 union and set up as shown in Figure 3 Page 3

Carry out the following test:

PI psig	PR	PD psig	Leakage cc/min
3000	Record	2000 (Adjusted by needle Valve D)	Record

to read:

3.6 "Post Hot Test Calibration Check

Repeat paragraph 3.1

5. Add the following as para. 3.7.

3.7 "Remove the AN814 -2SL plug from the base of the PRV and replace with a standard -2 union and set up as shown in Figure 3 Page_____.

Carry out the following test:

PI psig	PR	PD psig	Leakage cc/min
3000	Record	2000 (Adjusted by needle Valve D)	Record

6. Add the attached sheet as Figure 3.

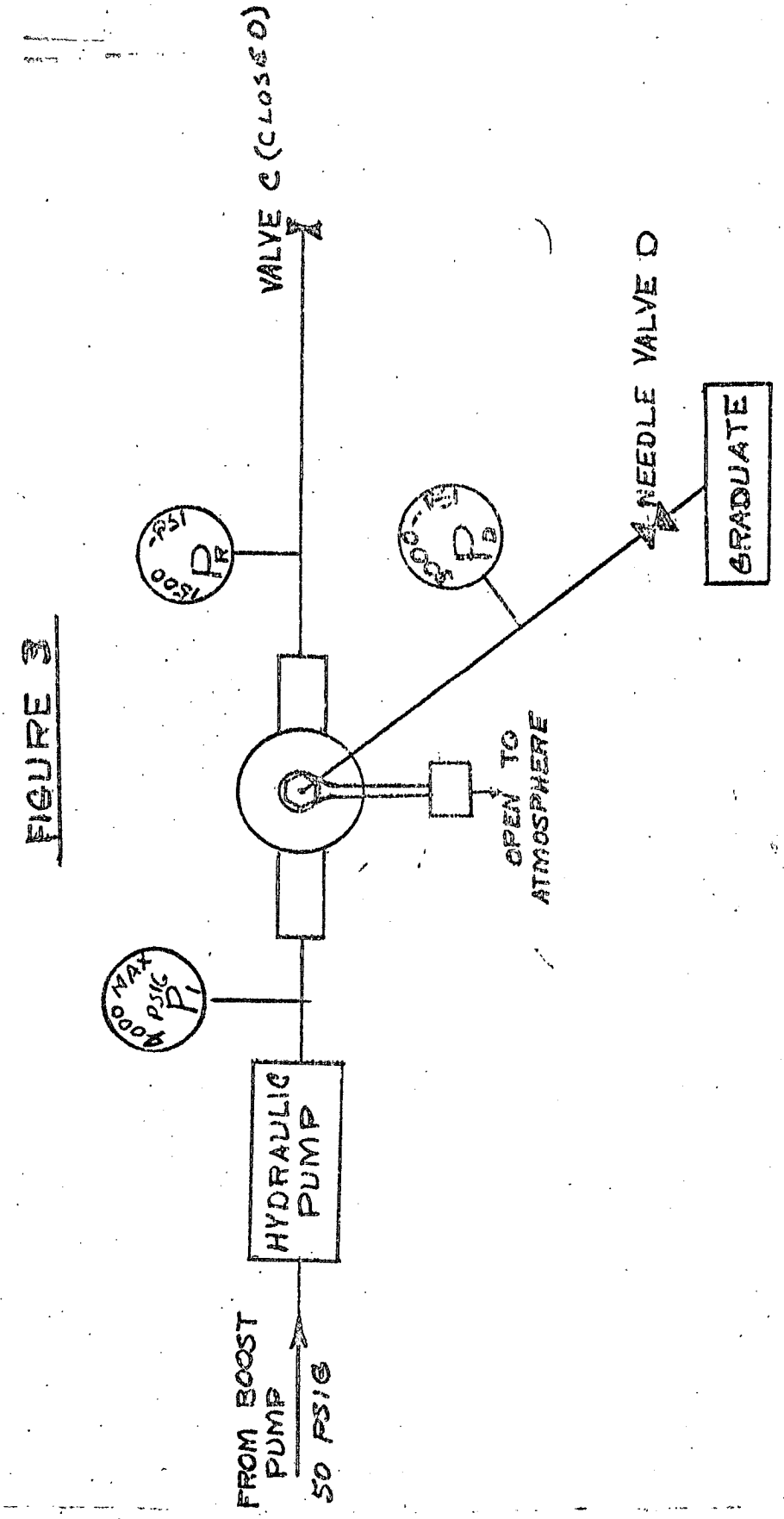

FIGURE 3

HAMILTON STANDARD
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H.S. 1494C
Amend. 2
Page 1 of 1
E.C. #74591
Date 11-24-62

H. S. 1494C - "PRESSURE REGULATOR - ENC, JFC47, CALIBRATION OF"

Amendment 2

Change paragraph 1.2 from:

". . . . shall be P&WA 523B."

To read:

". . . . shall be P&WA 523B containing .11 pounds of P&WA PS67 additive per 50 gallons of fluid."

HSP-7550 4/61

HS 1506D

Revision "C"
C73132
8/3/62
fmc

Revision "D"
E.C. AZ72240
9-20-62 js

CODE IDENT. NO. 73928

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HAMILTON STANDARD

DIVISION OF UNITED AIRCRAFT CORPORATION

WINDSOR LOCKS, CONNECTICUT, U. S. A.

SPECIFICATION NUMBER 1506D

TITLE CALIBRATION SCHEDULE FOR THE JFC47
WINDMILL BYPASS, CHECK & DUMP VALVE
ASSEMBLY P/N 571405 & 576497

PREPARED BY	R. E. Baum	10/26/61 DATE	APPROVED BY	R. P. Millerick	11/1/61 DATE
APPROVED BY	D. T. Feldman PROJECT ENGR.	11/1/61 DATE	APPROVED BY		DATE
APPROVED BY	DESIGN	DATE	EXP. RELEASE	Ernest P. Noske	11/3/61 DATE
APPROVED BY	INSPECTION DEPT.	DATE	APPROVED BY	PRODUCTION DEPT.	DATE
APPROVED BY	MATERIALS ENGR.	DATE	PROD RELEASE	Ernest P. Noske	11/3/61 DATE
GOVERNMENT (WHEN REQ'D)					DATE

3.1.1 With the valve, gages, etc. connected per Figure 4, set the following two conditions separately:

WFD	PDS	PD	WFS.	FBS	PI	P2
975-1025	25-35	50-55	80-200	185 REF	140 REF	40-50
Record P1	P1 shall equal 107-113 psi.					

Slowly decrease the fuel flow to zero by closing the inlet regulating valve. Observe the valve assembly for evidence of fuel shut off valve chatter. Chatter is defined as opening and closing at the fuel shut off which causes fluctuations in the fuel flow. Audibly snapping of the valve and rapid fuel flow fluctuations shall be considered evidence of chatter and the valve shall be rejected for repair and/or rework.

3.1.2 In order to bring the differential pressure, P1, within the limits of 107-113 psi, add or subtract shims, P/N 520128, as found necessary on the shutoff valve. (The addition of shims will increase P1).

*3.1.3 Test Point I:

Upon completion of the shimming of this valve, set and record the following conditions:

WFD	PDS	PD	P2	LIMIT WFS	LIMIT P1
975-1025	25-35	50-55	40-50	80-200	107-113

Record the leakage from the bypass standpipe, leakage from the overboard drain, and external leakage over a five (5) minute period.

*3.1.4 Test Point II

Increase the discharge flow to 1675-1725 pph and then to 34,500-35,500 pph set and record the following conditions:

spec	WFD	PDS	PD	P2	LIMIT WFS	LIMIT P1	LIMIT P3
1	1675-1725	170-180	160-170	40-50	80-200	107-113	
2	34,550-35,450	160-170	480-520	40-50			40 MAX.

Record the leakage from the bypass standpipe, leakage from the overboard drain, and external leakage over a five (5) minute period. Leakage from the bypass standpipe shall not exceed 5 cc per minute at test points I & II. Leakage from overboard drain shall not exceed 50 cc/min for 1000 pph and 50-55 PD test point I and 1 cc/min at test point II. There shall be no external leakage at each test point.

1.0 SCOPE

1.1 This specification covers the method of calibrating and acceptance testing the JFC-47 Windmill Bypass, Check and Dump Valve Assembly.

2.0 GENERAL REQUIREMENTS

2.1 Equipment Requirements

2.1.1 Flow bench capable of supplying at least 1000 to 40,000 pph fuel flow at 900 psig pressure and 2000 pph fuel flow at 1500 psig pressure.

2.1.2 Boost Pump capable of maintaining the stand fuel pump inlet pressure at 25-30 psig over a fuel flow range of 1000 to 40,000 pph.

2.1.3 Heat Exchanger to maintain the fuel temperature at the valve assembly inlet within the range of 95 ± 5°F.

2.1.4 Filter containing 25 to 40 micron element installed in the stand pump discharge line.

2.1.5 Test Fittings to adapt to the windmill bypass, check, and dump valve assembly standpipes.

2.2 Installation - The valve shall be mounted on the flowbench in either test position A or B as specified in Figures 1, 2, 3, or 4.

2.3 Instrumentation for taking the measurements listed below with the accuracy specified.

2.3.1 Pressure Gages

PI - Inlet pressure, at least 100-1500 psig pressure range with an accuracy of 1% of full scale.

PB - Bypass pressure, at least 20-200 psig pressure range with an accuracy of 1% of full scale, and a 50 to 1200 psig gage with accuracy of ±5 psig.

PD - Discharge pressure, at least 50-1200 psig pressure range with an accuracy of ±5 psig. When lines are connected per Figure 4 use a 0-200 psig gage ±1% full scale accuracy.

PDS - Discharge signal pressure, at least 20-200 psig pressure range with an accuracy of ±1% of full scale and at least 100-1000 psig pressure range with an accuracy of ±1% of full scale, depending upon the test set-up.

P1 - Differential pressure (PI-PDS) at least 0-150 psi pressure range with an accuracy of ±.5 psi in the range of 107-113 psi.

P2 - Differential pressure (PBS-PI) at least 0-100 psi pressure range with an accuracy of ±.5 psi in the range of 40-50 psi.

P3 - Differential pressure (PI-PD) at least 0-100 psi pressure range with an accuracy of ±1% of full scale.

2.3.1 Pressure Gages (Continued):

P4 - Differential pressure (PDS-PI) at least 0-100 psi pressure range with an accuracy of ±.5 psi in the range of 40-50 psi.

P5 - Differential pressure (PI-PBS) at least 0-150 psi pressure range with an accuracy of ±.5 psi in the range of 40-50 psi.

PBS-Bypass signal pressure, at least 20-200 psig pressure range with an accuracy of ±1% of full scale and at least 100-1000 psig pressure range with an accuracy of ±1% of full scale, depending upon the test set-up.

2.3.2 Fuel Flow Meters

Outlet fuel flow, at least 900-40,000 pph fuel flow range with an accuracy of ±1% within this range.

WFS - Signal fuel flow, at least 50-400 pph fuel flow range with an accuracy of ±1% within this range.

2.3.3 Fuel Temperature, measure at valve assembly inlet with at least a 80 to 100°F temperature range, with an accuracy of ±2°F. within this range.

2.4 Test Fluid shall be PMC9073 at 95 ± 5°F.

2.5 Data to be recorded

2.5.1 The following data should be recorded on each data sheet:

Valve Assembly Serial Number
Valve Assembly Part Number
Fuel Type and Specific Gravity
Fuel Inlet Temperature

2.5.2 The following data shall be recorded when specified:

PI - Inlet Pressure (psig)
PD - Discharge Pressure (psig)
PB - Bypass Pressure (psig)
PDS - Discharge Signal Pressure (psig)
PBS - Bypass Signal Pressure (psig)
WFD - Discharge Fuel Flow (pph)
WFB - Bypass Fuel Flow (pph)
P1 - Differential Pressure (psig)
P2 - Differential Pressure (psig)
P3 - Differential Pressure (psig)
P4 - Differential Pressure (psig)
P5 - Differential Pressure (psig)

WFS Signal Fuel Flow (PPH)

2.6 Inspection Requirement

The items marked with an asterisk (*) in this specification are HSD inspection items and as such must be under inspection surveillance by HSD.

3.0 TEST REQUIREMENTS

3.1 Shutoff Valve Operation

3.1.5 With the installed per Figure 4 set Pds = 30 ± 5 psig, Pbs = 200 ± 10 psig, P1 80 ± 10 psig, and Pd 55 ± 5 psig. From this condition set up the following test points in the order shown using test stand inlet control valve and the discharge control valve.

Note: Care should be taken not to overshoot the test points (it may take two or three practice runs before taking final test data).

Record: Inlet press. P1, discharge press. Pd., fuel flow Wf, and dump overboard valve leakage.

Test Point	Wf pph	Pd psig	Leakage Limit cc/min.
1	1000 ± 25	50-55	50 Max.
2	1700 ± 25	160-170	1 Max.

3 With the discharge valve closed and the bleed valve open regulate the discharge pressure at 120 ± 10 psig with the inlet by-pass valve.

Now reduce the inlet flow slowly by opening the inlet by-pass valve and observing the discharge pressure (Pd) at which the dump valve opens. For a more accurate reading hesitate at 20 psig Pd to determine if the pressure will bleed down through the bleed valve; if the pressure will not bleed down carefully open by-pass until dump valve opens.

Limit is 12 psig minimum.

Dump valve opening pressure is defined as the pressure at which the flow suddenly increases from the overboard drain and Pd suddenly decreases. If the discharge pressure will not drop below 12 psig due to test stand boost pressure or pressurised tank then the bleed in the discharge line will have to be opened to drop the pressure until the dump valve opens.

3.2 Windmill Bypass Operation

3.2.1 With the valve, gages, etc connected as in fig. 3, set the following conditions

Wf In	PB	PBS	P4
1675-1725	107-113	25-35	40-50

Record P5. P5 shall equal 107-113 psi.

3.2.2 In order to bring the differential pressure, P5, within the limits of 107-113 psi, add or subtract shims, P/N520128, as found necessary on the bypass valve.

3.2.3 Test Points:

Upon completion of the shimming of this valve set and record the following condition:

				Limits	
WfB	PB	PBS	P4	P5	Wfs
975-1025	107-113	25-35	40-50	107-113	80-200
1675-1725	107-113	25-35	40-50	107-113	80-200
spec. 4975-5025	107-113	135-150	40-50	107-113	---

Record the leakage from the discharge standpipes, leakage from the overboard drain, and external leakage over a (5) minute period. Leakage from the discharge standpipe shall not exceed 2 cc per minute at each test point. There shall be no external leakage at each test point.

3.3 Internal Leakage

With the valve mounted in the test position Figure 2 set the following points: Record inlet pressure PI.

Set	PI	Limits	
		PBS	PDS
#1	130-140	5 cc/min	2 cc/min
#2	520-560	5 cc/min	2 cc/min

Record leakage from the discharge signal standpipes and bypass signal standpipe at each point over a 5 minute period, starting at least 1 minute after setting the test point.

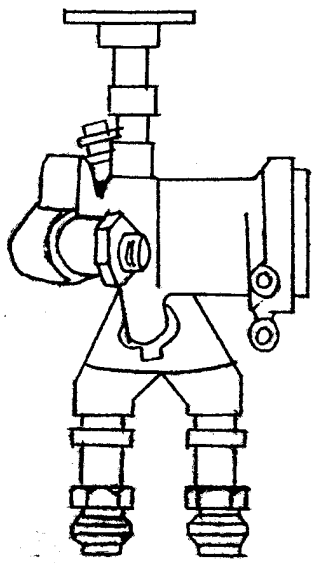
3.4 External Leakage

*3.4.1 With the valve, gages, etc. connected as in figure 1, set PI = 400-600 psig. Open the discharge signal valve and the bypass return valve. Close the bypass supply valve. Adjust PI until the discharge pressure, PD, is equal to 1100 ± 50 psig and inlet pressure is equal to 1100 ± 100 psig. Open the bypass supply valve and close the bypass return valve until bypass pressure, PB, is equal to 110 ± 5 psig. Record PI, PD, and PB and any external leakage over a five (5) minute period.

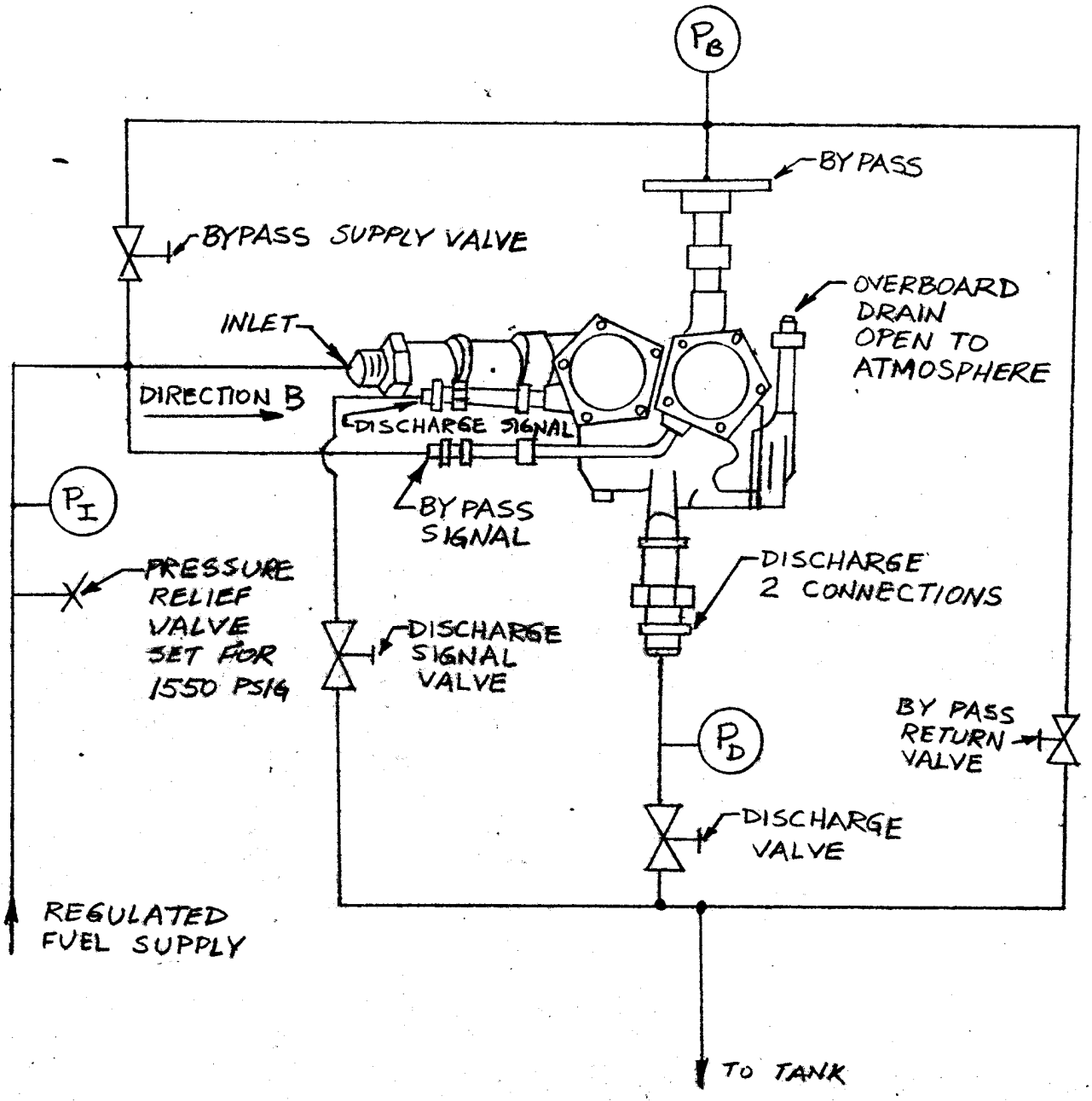
*3.4.2 With the same installation as in 3.4.1, open the bypass return valve, close the bypass supply valve, close the discharge signal valve, and close the discharge valve. Set PI equal to 1100 ± 50 psig. Record PI and any external leakage over a five (5) minute period. There shall be no external leakage over the five (5) minute period.

4.0 PRESERVATION AND STORAGE

4.1 After completion of testing, the windmill bypass, check and dump valve assembly shall be drained of fuel and prepared for storage in accordance with HS spec. 1613. Protection covers and containers shall be used to prevent damage or contamination of the assembly.

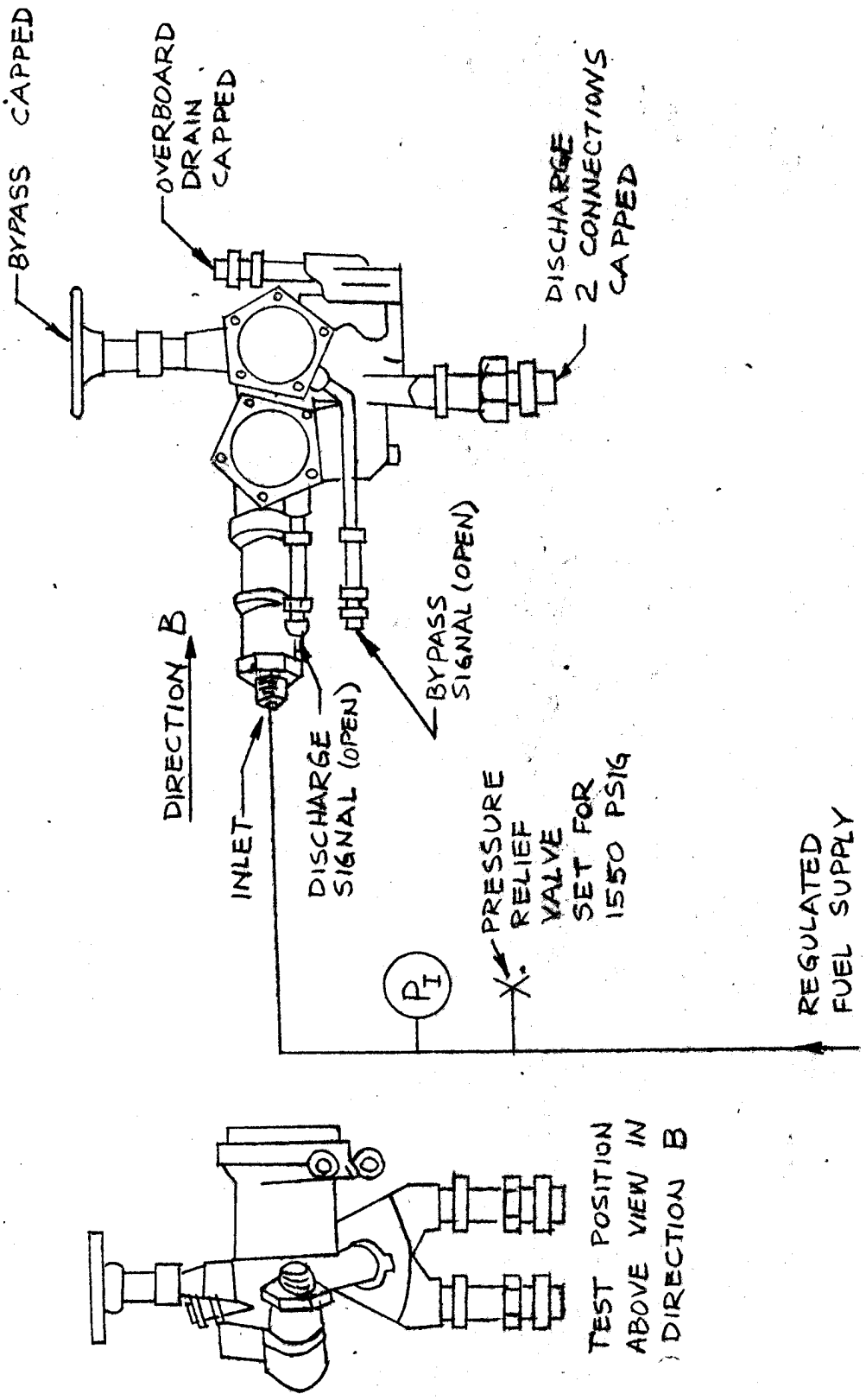


TEST POSITION
ABOVE VIEW IN
DIRECTION B



WINDMILL BY PASS, CHECK & DUMP VALVE ASSEMBLY
SCHEMATIC DIAGRAM

FIGURE 1



WINDMILL BYPASS, CHECK & DUMP VALVE ASSEMBLY
SCHEMATIC DIAGRAM

FIGURE 2

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
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Amend. 1
Page 1 of 2
E.C. 74066
Date: 10-16-62

H.S. 1506D CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 576497

Amendment 1

1. Change paragraph 3.4.1 from:

*3.4.1 With the valve, gages, etc. connected as in figure 1, set PI = 400-600 psig. Open the discharge signal valve and the bypass return valve. Close the bypass supply valve. Adjust PI until the discharge pressure, PD, is equal to 1100 ± 50 psig and inlet pressure is equal to 1100 ± 100 psig. Open the bypass supply valve and close the bypass return valve until bypass pressure, PB, is equal to 110 ± 5 psig. Record PI, PD, and PB and any external leakage over a five (5) minute period.

to read:

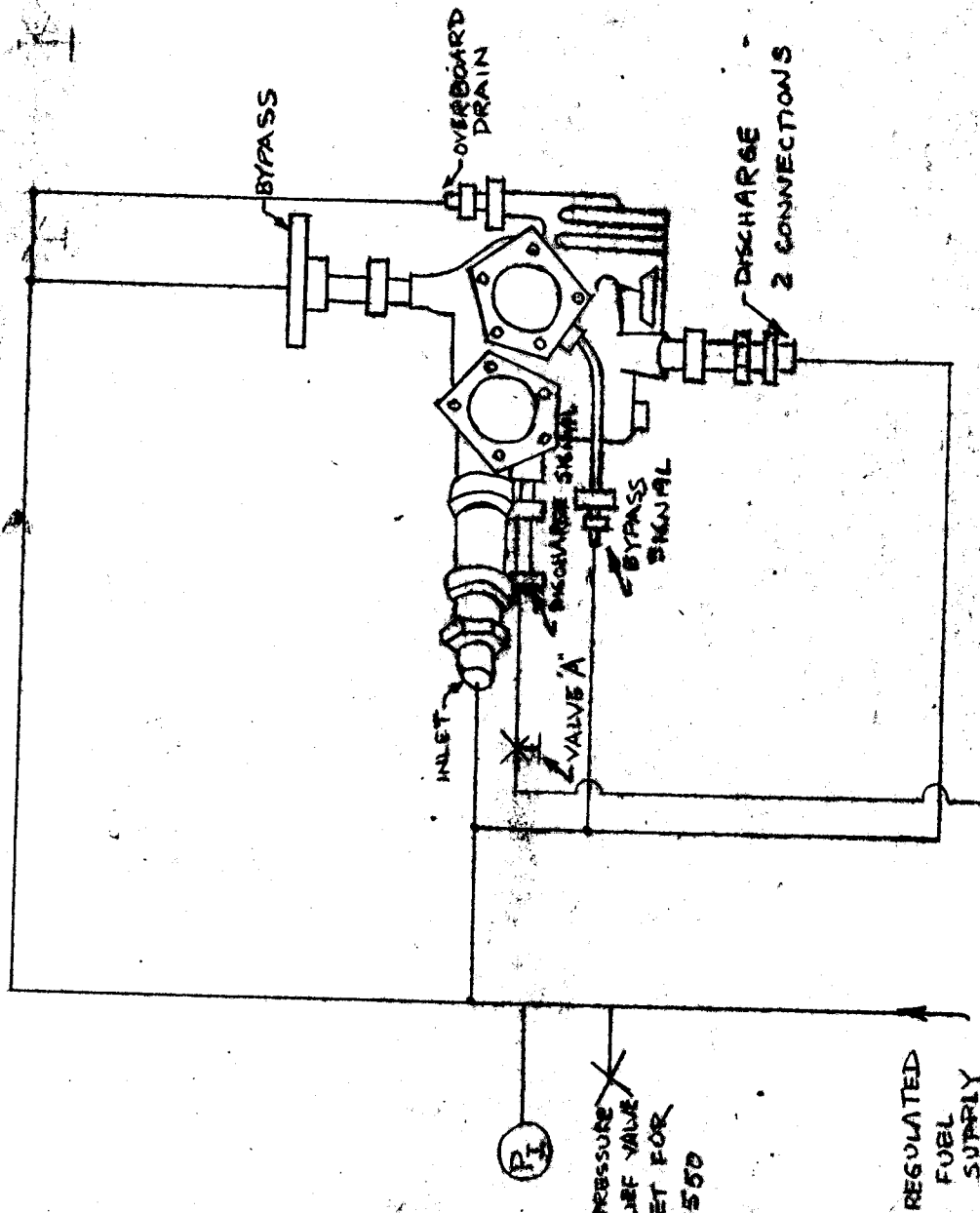
*3.4.1 With valve, gages, etc. connected as in Figure 1, open valve A and increase pressure PI to 300 PSI. Close valve A and slowly increase pressure to 1100 ± 50 psi. Hold at this pressure for ten (10) minutes. Then carefully inspect for external leakage all over the control surface.

3. Delete paragraph 3.4.

4. Replace Fig. 1 with attached Fig. 1.

FIGURE 1

WINDMILL BYPASS, CHECK & DUMP VALVE ASSEMBLY
SCHEMATIC DIAGRAM



HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT

H.S. 1506D
Amend. 2
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E.O. 73697
Date: 11-7-62

H.S. 1506D "CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BYPASS, CHECK & DUMP VALVE ASSEMBLY P/N 571405 & 576497"

Amendment 2

1. Change paragraph 3.4.1 from:

3.4.1 "With valve, gages, etc. connected as in Figure 1, open valve A and increase pressure PI to 300 PSI. Close valve A and slowly increase pressure to 1100 ± 50 psi. Hold at this pressure for (10) minutes. Then carefully inspect for external leakage all over the control surface.

to read:

3.4.1 "With the valves, gages, etc. connected as in figure 1, open valve A and increase pressure PI to 300 psig. Close valve A and slowly increase pressure PI to 1100 ± 50 psig. Record PI. Hold at this pressure for ten (10) minutes, carefully inspecting for external leakage all over the control surface. There shall be no external leakage over the ten (10) minute period.

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H. S. 1506D "CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 576497"

Amendment 3

1. Change paragraph 3.1.3 from:

"3.1.3 Test Point I

Upon completion of the shimming of this valve, set and record the following conditions:

WFD	PDS	PD	P2	LIMIT Wfs	LIMIT P1
975-1025	25-35	50-55	40-50	80-200	107-113

Record the leakage from the bypass standpipe, leakage from the overboard drain, and external leakage over a five (5) minute period."

to read:

"*3.1.3 Test Point I:

Upon completion of the shimming of this valve, set and record the following conditions:

WFD	PDS	PD	P2	LIMIT Wfs	LIMIT P1	P1
975-1025	25-35	50-55	40-50	80-200	107-113	125-15

Record the leakage from the bypass standpipe, leakage from the overboard drain, and external leakage over a five (5) minute period."

2. Change paragraph 3.1.4 from:

"*3.1.4 Test Point II

Increase the discharge flow to 1675-1725 pph and then to 34,500-35,500 pph set and record the following conditions:

E. O. 1506D "CALIBRATION SCHEDULE FOR THE JFO47 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 576497"

Amendment 3

2. (Continued)

SPEC	WFD	PDS	PD	P2	LIMIT WFS	LIMIT P1	LIMIT P3
1	1675-1725	170-180	160-170	40-50	80-200	107-113	
2	34,550-35,450	160-170	480-520	40-50			40 Max

Record the leakage from the bypass standpipe, leakage from the overboard drain, and external leakage over a five (5) minute period. Leakage from the bypass standpipe shall not exceed 5 cc per minute at test points I and II. Leakage from overboard drain shall not exceed 50 cc/min for 1000 pph and 50-55 PD test point I and 1 cc/min at test point II. There shall be no external leakage at each test point."

to read:

"4.1.4 Test Point II

Increase the discharge flow to 1675-1725 pph and then to 34,500-35,500 pph set and record the following conditions:

SPEC	WFD	PDS	PD	P2	LIMIT WFS	LIMIT P1	LIMIT P3	P1
1	1675-1725	170-180	160-170	40-50	80-200	107-113		270-300
2	34,550-35,450	160-170	480-520	40-50			40 MAX.	

Record the leakage from the bypass standpipe, leakage from the overboard drain, and external leakage over a five (5) minute period. Leakage from the bypass standpipe shall not exceed 5 cc per minute at test points I & II. Leakage from overboard drain shall not exceed 50 cc/min for 1000 pph and 50-55 PD test point I and 1 cc/min at test point II. There shall be no external leakage at each test point."

H. S. 1506D "CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571005 AND 576497"

Amendment 13

3. Change paragraph 3.1.5 from:

"3.1.5 With the installed per Figure 4 set Pds - 30 ± 5 psig, Pus - 200 ± 10 psig, P1 80 ± 10 psig, and Pd 55 ± 5 psig. From this condition set up the following test points in the order shown using test stand inlet control valve and the discharge control valve.

Note: Care should be taken not to overshoot the test points (it may take two or three practice runs before taking final test data).

Record: Inlet press. P1, discharge press. Pd., fuel flow Wf, and dump overboard valve leakage.

Test Point	Wf pph	Pd psig	Leakage Limit cc/min.
1	1000 ± 25	50-55	50 Max.
2	1700 ± 25	160-170	1 Max.

3 With the discharge valve closed and the bleed valve open regulate the discharge pressure at 120 ± 10 psig with the inlet by-pass valve.

Now reduce the inlet flow slowly by opening the inlet by-pass valve and observing the discharge pressure (Pd) at which the dump valve opens. For a more accurate reading hesitate at 20 psig Pd to determine if the pressure will bleed down through the bleed valve; if the pressure will not bleed down carefully open by-pass until dump valve opens.

Limit is 12 psig minimum.

Dump valve opening pressure is defined as the pressure at which the flow suddenly increases from the overboard drain and Pd suddenly decreases. If the discharge pressure will not drop below 12 psig due to test stand boost pressure or pressurized tank then the bleed in the discharge line will have to be opened to drop the pressure until the dump valve opens."

H. S. 1506D "CALIBRATION SCHEDULE FOR THE JT3C7 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 57049"

Amendment 3

3. (continued)

Change paragraph 3.1.5 to read:

"3.1.5 With the installed per Figure 4 set Pds = 50 ± 5 psig, Pts = 200 ± 10 psig, PI 80 ± 10 psig, and Pd 55 ± 5 psig. From this condition set up the following test points in the order shown using test stand inlet control valve and the discharge control valve.

Note: Care should be taken not to overshoot the test points (it may take two or three practice runs before taking final test data).

Record: Inlet press. PI, discharge press. Pd., fuel flow Wf, and dump overboard valve leakage.

Test Point	Wf pph	Pd psig	Leakage Limit cc/
1	2000 ± 25	50-55	50 Max.
2	1700 ± 25	160-170	1 Max.

3 With the discharge valve open and the bleed valve closed regulate the discharge pressure at 120 ± 10 psig with the inlet by-pass valve.

Now reduce the inlet flow slowly by opening the inlet by-pass valve until PD drops to 40 psig. If pressure remains at 40 psig, open bleed valve so that PD drops slowly. Observe disch. pressure PD at which dump valve opens.

Limit is 12 psig minimum.

Dump valve opening pressure is defined at the pressure at which the flow suddenly increases from the overboard drain and Pd suddenly decreases. If the discharge pressure will not drop below 42 psig due to test stand boost pressure or pressurized tank then the bleed in the discharge line will have to be opened to drop the pressure until the dump valve opens."

M. S. 1506D "CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 576497"

Amendment 3

4. Change paragraph 3.2.1 from:

"3.2.1 With the valve, gages, etc connected as in fig. 3, set the following conditions:

Wf In	PB	PBS	P4
1675-1725	107-113	25-35	40-50

Record PS. PS shall equal 107-113psi"

to read:

"3.2.1 With the valve, gages, etc connected as in fig. 3, set the following conditions

WfB	PB	PBS	P4
1675-1725	107-113	25-35	40-50

Record PS. PS shall equal 107-113 psi."

5. Change paragraph 3.2.3 from:

"3.2.3 Test Points:

Upon completion of the shimming of this valve set and record the following conditions:

	WfB	PB	PBS	P4	Limits PS	WfB
	975-1025	107-113	25-35	40-50	107-113	80-200
	1675-1725	107-113	25-35	40-50	107-113	80-200
spec.	4975-5025	107-113	135-150	40-50	107-113	—

Record the leakage from the discharge standpipes, leakage from the overboard drain, and external leakage over a (5) minute period. Leakage from the discharge standpipe shall not exceed 2 cc per minute at each test point. There shall be no external leakage at each test point."

S. S. 1506D "CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 576497"

Amendment 5

5. (continued) Change paragraph 3.2.3 to read:

"3.2.3 Test Points:

Upon completion of the shimming of this valve set and record the following conditions

	WfB	PB	PBS	P4	P5	Limits P1	Wf3
	975-1025	107-113	25-35	40-50	107-113	125-155	80-200
	1675-1725	107-113	25-35	40-50	107-113	125-155	80-200
spec.	4975-5025	107-113	135-150	50-50	107-113	235-270	---

Record the leakage from the discharge standpipes, leakage from the overboard drain, and external leakage over a (5) minute period. Leakage from the discharge standpipe shall not exceed 2 cc per minute at each test point. There shall be no external leakage at each test point."

6. Replace figure 3 with attached revised figure 3.

7. Replace figure 4 with attached revised figure 4.

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H.S. 1506D
Amend. 4
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E.C. 74629
Date: 11-21-62

H. S. 1506D "CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BY-PASS, CHECK & DUMP VALVE, ASSEMBLY P/N 571405 and 576497"

Amendment 4

1. In Amendment #1 to H.S. 1506D, change sentence 3 from "Delete Paragraph 3.4" to read "Delete Paragraph 3.4.2."

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
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H.S. 1506D
Amend. 5
Page 1 of 1
E.C. AE 74591
Date: 11-24-62

H. S. 1506D -"CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BYPASS, CHECK AND DUMP VALVE ASSEMBLY P/N 571405 and 576497"

Amendment 5

Add the following sentence to paragraph 2.4:

"The test fluid shall contain .11 pounds of P&WA PS67 additive per 50 gallons of fluid."

NOTICE:

Add figures 3 & 4 of H.S. Spec. 1506D, Amend 3 and change pages 1 thru 6 to read 1 thru 8. These pages were inadvertently omitted from amendment when published by Engineering Records.

Please replace your file copies with the attached sheets.

THANK YOU
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WINDSOR LOCKS, CONNECTICUT

H.S. 1506D
Amend. 3
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REISSUE

H. S. 1506D "CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 576497"

Amendment 3

1. Change paragraph 3.1.3 from:

"3.1.3 Test Point I

Upon completion of the shimming of this valve, set and record the following conditions:

WFD	PDS	PD	P2	LIMIT WfS	LIMIT P1
975-1025	25-35	50-55	40-50	80-200	107-113

Record the leakage from the bypass standpipe, leakage from the overboard drain, and external leakage over a five (5) minute period."

to read:

"#3.1.3 Test Point I:

Upon completion of the shimming of this valve, set and record the following conditions:

WFD	PDS	PD	P2	LIMIT WfS	LIMIT P1	P1
975-1025	25-35	50-55	40-50	80-200	107-113	125-155

Record the leakage from the bypass standpipe, leakage from the overboard drain, and external leakage over a five (5) minute period."

2. Change paragraph 3.1.4 from:

"#3.1.4 Test Point II

Increase the discharge flow to 1675-1725 pph and then to 34,500-35,500 pph set and record the following conditions:

H. S. 1506D "CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 576497"

Amendment 3

2. (continued)

SPEC	WFD	PDS	PD	P2	LIMIT WfS	LIMIT P1	LIMIT P3
1	1675-1725	170-180	160-170	40-50	80-200	107-113	
2	34,550-35,450	160-170	480-520	40-50			40 Max

Record the leakage from the bypass standpipe, leakage from the overboard drain, and external leakage over a five (5) minute period. Leakage from the bypass standpipe shall not exceed 5 cc per minute at test points I and II. Leakage from overboard drain shall not exceed 50 cc/min for 1000 pph and 50-55 PD test point I and 1 cc/min at test point II. There shall be no external leakage at each test point."

to read:

"3.1.4 Test Point II

Increase the discharge flow to 1675-1725 pph and then to 34,500-35,500 pph set and record the following conditions:

SPEC	WFD	PDS	PD	P2	LIMIT WfS	LIMIT P1	LIMIT P3	PI
I	1675-1725	170-180	160-170	40-50	80-200	107-113		270-300
2	34,550-35,450	160-170	480-520	40-50			40 MAX.	

Record the leakage from the bypass standpipe, leakage from the overboard drain, and external leakage over a five (5) minute period. Leakage from the bypass standpipe shall not exceed 5 cc per minute at test points I & II. Leakage from overboard drain shall not exceed 50 cc/min for 1000 pph and 50-55 PD test point I and 1 cc/min at test point II. There shall be no external leakage at each test point."

H. S. 1506D "CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 576497"

Amendment 3

3. Change paragraph 3.1.5 from:

"3.1.5 With the installed per Figure 4 set Pds = 30 ± 5 psig, Pbs = 200 ± 10 psig, P1 80 ± 10 psig, and Pd 55 ± 5 psig. From this condition set up the following test points in the order shown using test stand inlet control valve and the discharge control valve.

Note: Care should be taken not to overshoot the test points (it may take two or three practice runs before taking final test data).

Record: Inlet press. P1, discharge press. Pd., fuel flow Wf, and dump overboard valve leakage.

Test Point	Wf pph	Pd psig	Leakage Limit cc/min.
1	1000 ± 25	50-55	50 Max.
2	1700 ± 25	160-170	1 Max.

3 With the discharge valve closed and the bleed valve open regulate the discharge pressure at 120 ± 10 psig with the inlet by-pass valve.

Now reduce the inlet flow slowly by opening the inlet by-pass valve and observing the discharge pressure (Pd) at which the dump valve opens. For a more accurate reading hesitate at 20 psig Pd to determine if the pressure will bleed down through the bleed valve; if the pressure will not bleed down carefully open by-pass until dump valve opens.

Limit is 12 psig minimum.

Dump valve opening pressure is defined as the pressure at which the flow suddenly increases from the overboard drain and Pd suddenly decreases. If the discharge pressure will not drop below 12 psig due to test stand boost pressure or pressurized tank then the bleed in the discharge line will have to be opened to drop the pressure until the dump valve opens."

H. S. 1506D "CALIBRATION SCHEDULE FOR THE JP6A7 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 576497".

Amendment 3

3. (continued)

Change paragraph 3.1.5 to read:

*3.1.5 With the installed per Figure 4 set Pds = 30 ± 5 psig, Pbs = 200 ± 10 psig, PI 80 ± 10 psig, and Pd 55 ± 5 psig. From this condition set up the following test points in the order shown using test stand inlet control valve and the discharge control valve.

Note: Care should be taken not to overshoot the test points (it may take two or three practice runs before taking final test data).

Record: Inlet press. PI, discharge press. Pd., fuel flow Wf, and dump overboard valve leakage.

Test Point	Wf pph	Pd psig	Leakage Limit cc/min
1	1000 ± 25	50-55	50 Max.
2	1700 ± 25	160-170	1 Max.

3 With the discharge valve open and the bleed valve closed regulate the discharge pressure at 120 ± 10 psig with the inlet by-pass valve.

Now reduce the inlet flow slowly by opening the inlet by-pass valve until PD drops to 40 psig. If pressure remains at 40 psig, open bleed valve so that PD drops slowly. Observe disch. pressure PD at which dump valve opens.

Limit is 12 psig minimum.

Dump valve opening pressure is defined at the pressure at which the flow suddenly increases from the overboard drain and Pd suddenly decreases. If the discharge pressure will not drop below 12 psig due to test stand boost pressure or pressurized tank then the bleed in the discharge line will have to be opened to drop the pressure until the dump valve opens."

H. S. 1506D "CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 576497"

Amendment 3

4. Change paragraph 3.2.1 from:

"3.2.1 With the valve, gages, etc connected as in fig. 3, set the following conditions:

Wf In	PB	PBS	P4
1675-1725 Record P5.	107-113 P5 shall equal 107-113psi"	25-35	40-50

to read:

"3.2.1 With the valve, gages, etc connected as in fig. 3, set the following conditions

WfB	PB	PBS	P4
1675-1725 Record P5.	107-113 P5 shall equal 107-113 psi."	25-35	40-50

5. Change paragraph 3.2.3 from:

"3.2.3 Test Points:

Upon completion of the shimming of this valve set and record the following condition:

	WfB	PB	PBS	P4	P5 Limits	WfB
	975-1025	107-113	25-35	40-50	107-113	80-200
	1675-1725	107-113	25-35	40-50	107-113	80-200
spec.	4975-5025	107-113	135-150	40-50	107-113	----

Record the leakage from the discharge standpipes, leakage from the overboard drain, and external leakage over a (5) minute period. Leakage from the discharge standpipe shall not exceed 2 cc per minute at each test point. There shall be no external leakage at each test point."

H. S. 1506D "CALIBRATION SCHEDULE FOR THE JFC47 WINDMILL BY-PASS, CHECK AND DUMP VALVE, ASSEMBLY P/N 571405 AND 576497"

Amendment 3

5. (continued) Change paragraph 3.2.3 to read:

"3.2.3 Test Points:

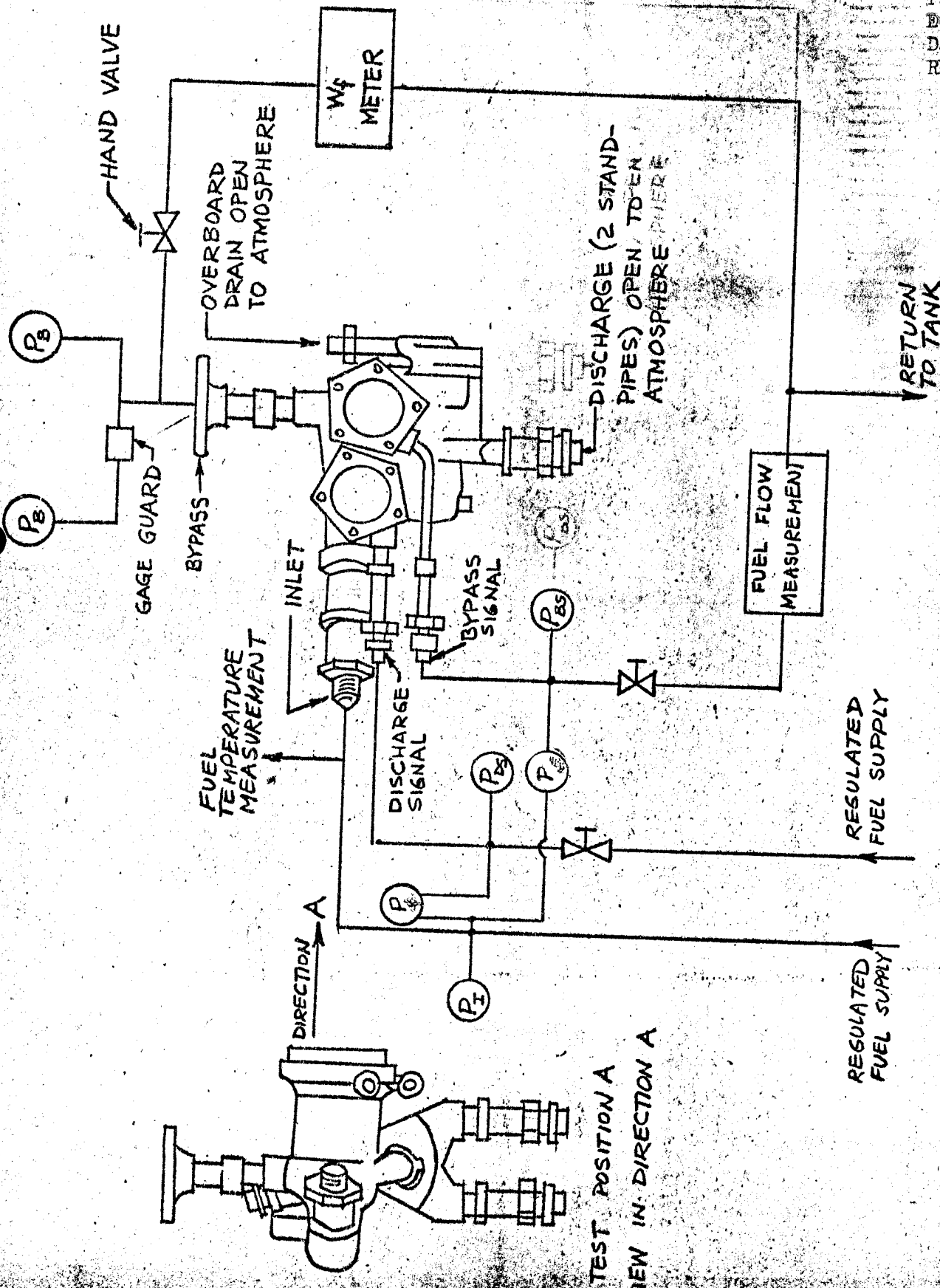
Upon completion of the shimming of this valve set and record the following conditions

	WfB	PB	PBS	P4	P5	Limits PT	WfS
	975-1025	107-113	25-35	40-50	107-113	125-155	80-200
	1675-1725	107-113	25-35	40-50	107-113	125-155	80-200
spec.	4975-5025	107-113	135-150	40-50	107-113	235-270	----

Record the leakage from the discharge standpipes, leakage from the overboard drain, and external leakage over a (5) minute period. Leakage from the discharge standpipe shall not exceed 2 cc per minute at each test point. There shall be no external leakage at each test point."

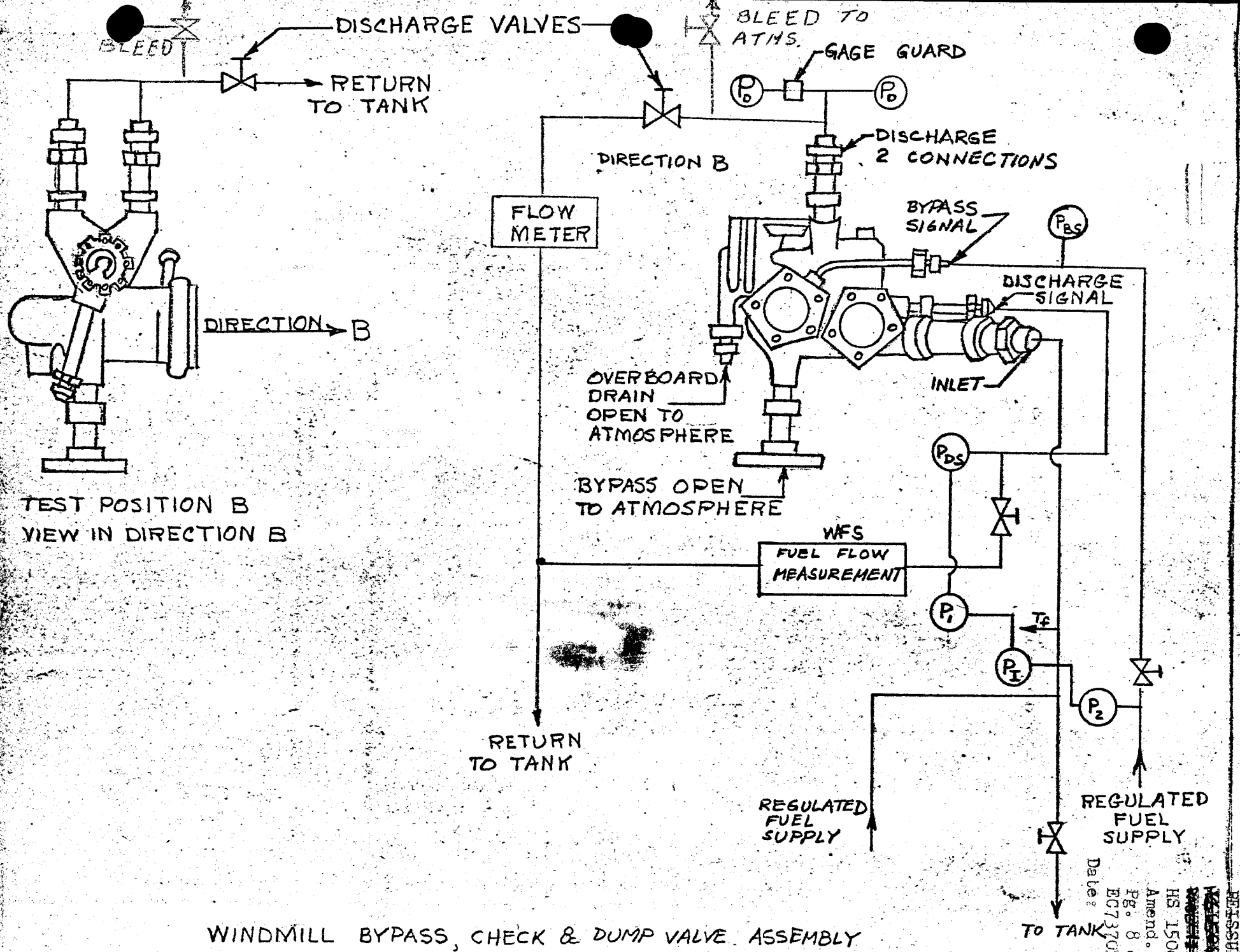
6. Replace figure 3 with attached revised figure 3.

7. Replace figure 4 with attached revised figure 4.



WINDMILL BYPASS, CHECK & DUMP VALVES ASSEMBLY
SCHEMATIC DIAGRAM FOR TEST POSITION A

FIGURE 3



WINDMILL BYPASS, CHECK & DUMP VALVE ASSEMBLY
SCHEMATIC DIAGRAM FOR TEST POSITION B

FIGURE 4

HS 1506D
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EC73701
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1.0 SCOPE

1.1 This specification covers the method of testing and calibrating the JFC-47 Interim Bypass Valve Assembly.

2.0 GENERAL REQUIREMENT

2.1 Equipment Requirement

2.1.1 Flowbench capable of supplying at least 1000 to 35,000 PPH fuel flow at 900 psig pressure.

2.1.2 Boost Pump capable of maintaining the stand fuel pump inlet pressure at 25 ±5 psig over a fuel flow range of 1000 to 35,000 PPH.

2.1.3 Heat Exchanger to maintain the fuel temperature at the valve assembly inlet within the range of 70° to 110°F.

2.1.4 Filter containing 25 to 40 micron element installed in the stand pump discharge line.

2.1.5 Test fitting 544900-ET-33, to adapt to valve assembly standpipes.

2.2 Installation

2.2.1 The valve assembly shall be mounted on the flow bench and installed per Figure 1 or 2 as applicable.

2.3 Instrumentation for taking the measurements listed below with the accuracy specified.

2.3.1 Pressure Gages

PI - Inlet pressure, at least 50 - 1500 psig pressure range with an accuracy of ± 5 psig within this range.

PD - Discharge pressure, at least 50 - 1500 psig pressure range with an accuracy of ± 5 psig within this range.

PS - Signal pressure, at least 50 - 600 psig pressure range with an accuracy of ± 3 psig within this range.

ΔP1 - Inlet Press minus signal press. (P1-Ps) at least 0-150 psi pressure range with an accuracy of ±.5% in the range of 107-113 psi.

ΔP2 - Inlet Press minus discharge press (P1-Pd) at least 0-50 psi press range with an accuracy of 5% in range of 25 psi.

2.3.2 Fuel Flow Meter

WFD - Discharge fuel flow, at least 1000 - 35,000 PPH fuel flow range with an accuracy of ± 1% within this range.

2.3.3 Fuel Temperature, measure at valve assembly inlet with at least a 70° to 110°F temperature range, with an accuracy of ±2°F within this range.

2.4 Test Fluid shall be PW 523B or PMC9073.

2.5 Data to be recorded

2.5.1 The following data should be recorded on each data sheet:

Valve Assembly Serial Number
Valve Assembly Part Number
Fuel Type and Specific Gravity
Fuel Inlet Temperature

2.5.2 The following data shall be recorded when specified:

Δ PI - (P1-Ps)
P1 - Inlet Pressure
PD - Discharge Pressure
PS - Signal Pressure
WfD - Discharge Fuel Flow
ΔPD - (P1 - PD)

3.0 TEST REQUIREMENTS

3.1 Connect the line valves and gages as shown in Figure 2 for 577911. Regulate the signal supply valve to obtain 25-35 psi and open the discharge valve. Regulate the inlet valve to obtain a fuel flow of 1150 ± 50 PPH with PD set at 70 ± 5 nd record the differential pressure (P1 - PS). The differential pressure Δ P1 should be 110 ± 3 psi. Repeat at a fuel flow of 1700 ± 25 pph, with Ps at 172 to 182 psig and PD at 202 ± 10 psig. ΔP1 should be 110 ± 5 psi. For 577162 valve connect line as shown in Fig 1. Regulate PBS t. 172-182 psig and WfD to 1700 ± 25. Δ P1 should be 110 ± 3 psi.

3.2 In order to bring the differential pressure, PI - PS, within the limits of 110 ± 3 psi, add or subtract shims, P/N 553130, as found necessary.

3.3 With 577911 valve install as in fig 2, and Signal Pressure (PS) set at 167 ± 15 psig, PD at 510 ± 15 psig pass 35,000 ± 500 PPH fuel flow through the valve. Record Inlet Pressure (PI) and Discharge Pressure (PD). ΔP2 shall not exceed 40 psi. For 577162 Valve set PBs - 135 - 150, PD at 48 ± 2 psi and pass 5000 pph through the valve. Record P1, PD. No Δ P limit.

3.4 With conditions as in 3.3, raise Signal Pressure (PS) up to 45 ± 5 psig greater than inlet Pressure (PI) by opening up the signal supply valve and measure leakage out of the discharge standpipe. Maximum allowable leakage is 5 cc/min.

3.5 With discharge, and signal press connections interconnected apply 1100 ± 50 psig to the inlet and signal connections. There shall be no external leakage over a five (5) minute period.

3.6 Disconnect inlet supply line and apply 135 ± 5 psig and 540 ± 20 psig. At each point measure the leakage from PD. Maximum leakage should not exceed 2 cc/min.

4.0 PRESERVATION AND STORAGE

4.1 After completion of testing, the Interim Bypass Valve shall be drained of fuel and prepared for storage in accordance with H.S.Spec. 1613 as applicable. Protection covers and containers shall be used to prevent damage or contamination of the assembly.

5.0 APPLICABLE FIGURES

Figure 1 & 2. Schematic diagram for valve operation.

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Date: 8-5-62

H.S. 1582A "CALIBRATION SCHEDULE FOR THE JFC47 INTERIM BYPASS VALVE ASSY P/N577162 AND INTERIM SOV, 577163 & 577911"

Amendment /

1. Change para 3.1 from:

3.1 "Connect the line valves and gages as shown in Figure 2 for 577911. Regulate the signal supply valve to obtain 172-182 psi and open the discharge valve. Regulate the inlet valve to obtain a fuel flow of 1150 ± 50 PPH with PD set at 202 ± 10 and record the differential pressure (PI - PS). The differential pressure ΔP2 should be 110 ± 3 psi. For 577162 valve connect line as shown in Fig 1. Regulate PDS to 25-35 psig and WfD to 1700 ± 25. Δ P2 should be 110 ± 3 psi.

to read:

3.1 "Connect the line valves and gages as shown in Figure 2 for 577911. Regulate the signal supply valve to obtain 172-182 psi and open the discharge valve. Regulate the inlet valve to obtain a fuel flow of 1150 ± 50 PPH with PD set at 202 ± 10 and record the differential pressure (PI - PS). The differential pressure ΔP1 should be 110 ± 3 psi. For 577162 valve connect line as shown in Fig 1. Regulate PDS to 25-35 psig and WfD to 1700 ± 25. Δ P1 should be 110 ± 3 psi."

2. Change para. 3.3 from:

"With 577911 valve install as in fig 2, and Signal Pressure (PS) set at 167±15 psig, pass 35,000 ± 500 PPH fuel flow through the valve. Record Inlet Pressure (PI) and Discharge Pressure (PD). ΔP1 shall not exceed 40 psi. For 577162 Valve set Ps = 135-150 and pass 5000 pph through the valve. Record P1, Pd. No Δ P limit."

to read:

"With 577911 valve install as in fig 2, and Signal Pressure (PS) set at 167 ± 15psig, pass 35,000 ± 500 PPH fuel flow through the valve. Record Inlet Pressure (PI) and Discharge Pressure (PD). Δ P2 shall not exceed 40 psi. For 577162 Valve set Ps = 135-150 and pass 5000 pph through the valve. Record P1, PD. No Δ P limit."

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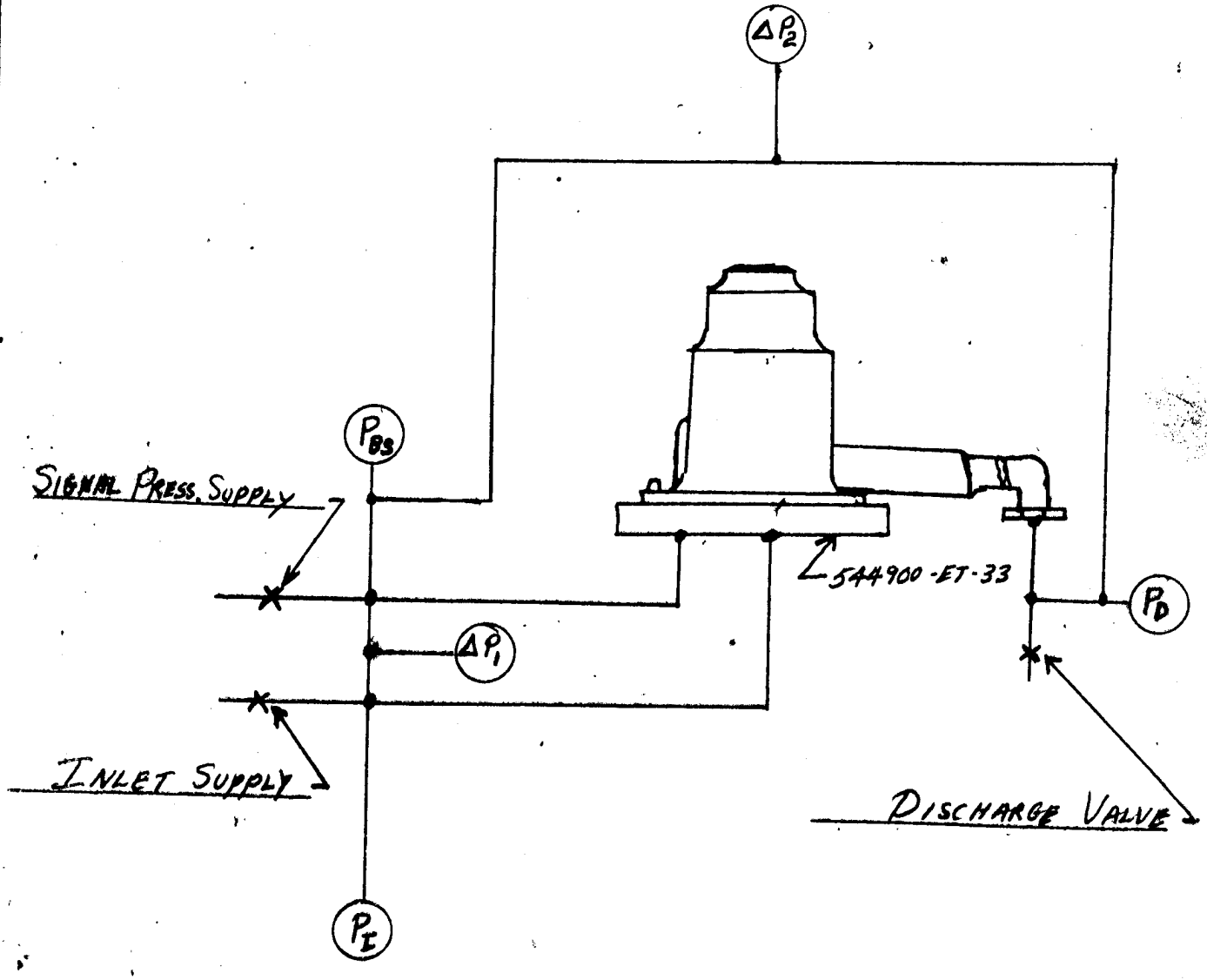

FIGURE I

JFC-47 BYPASS VALVE
577162

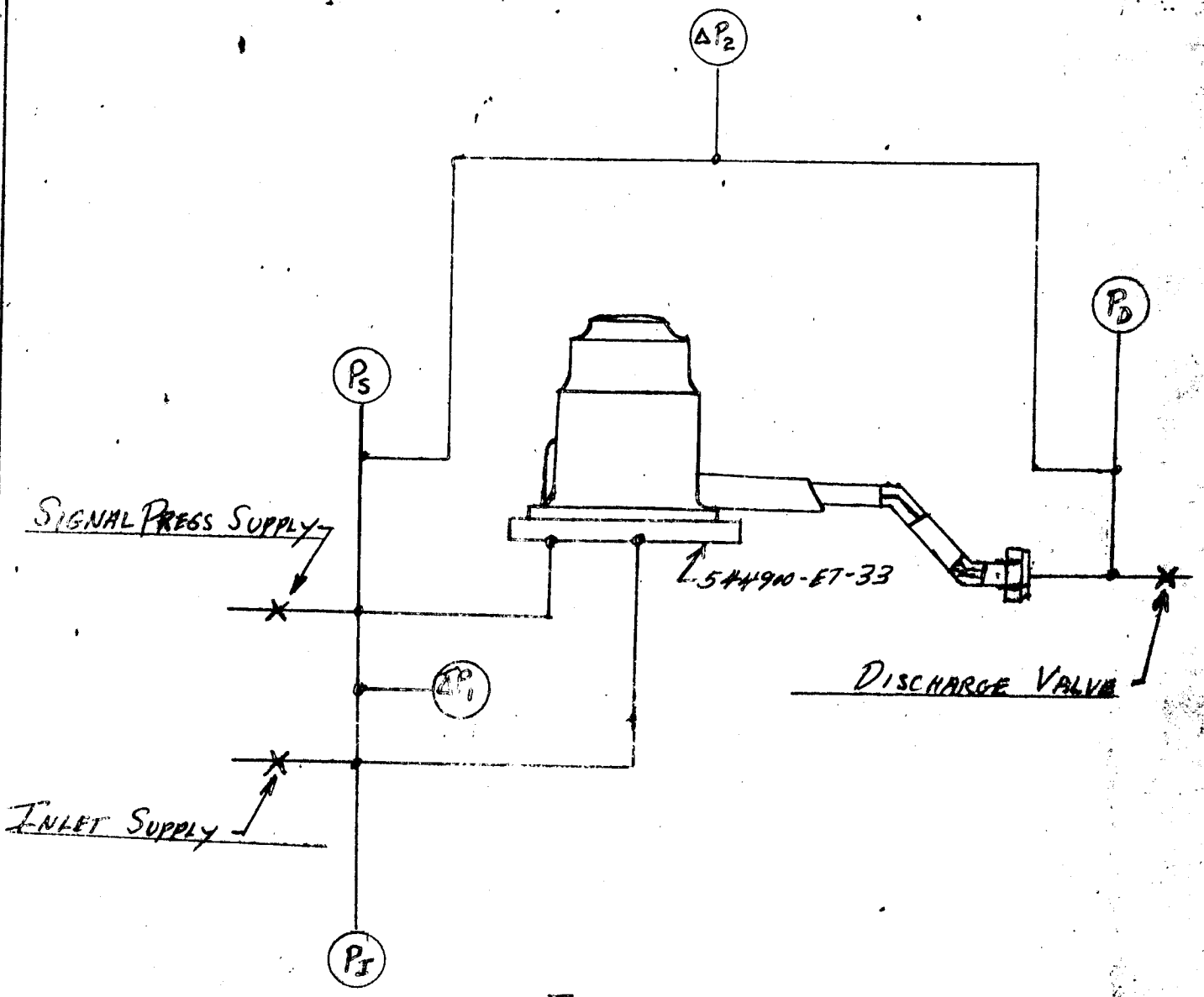

FIGURE II

JFC-47 MIN PRESS SOV

577911